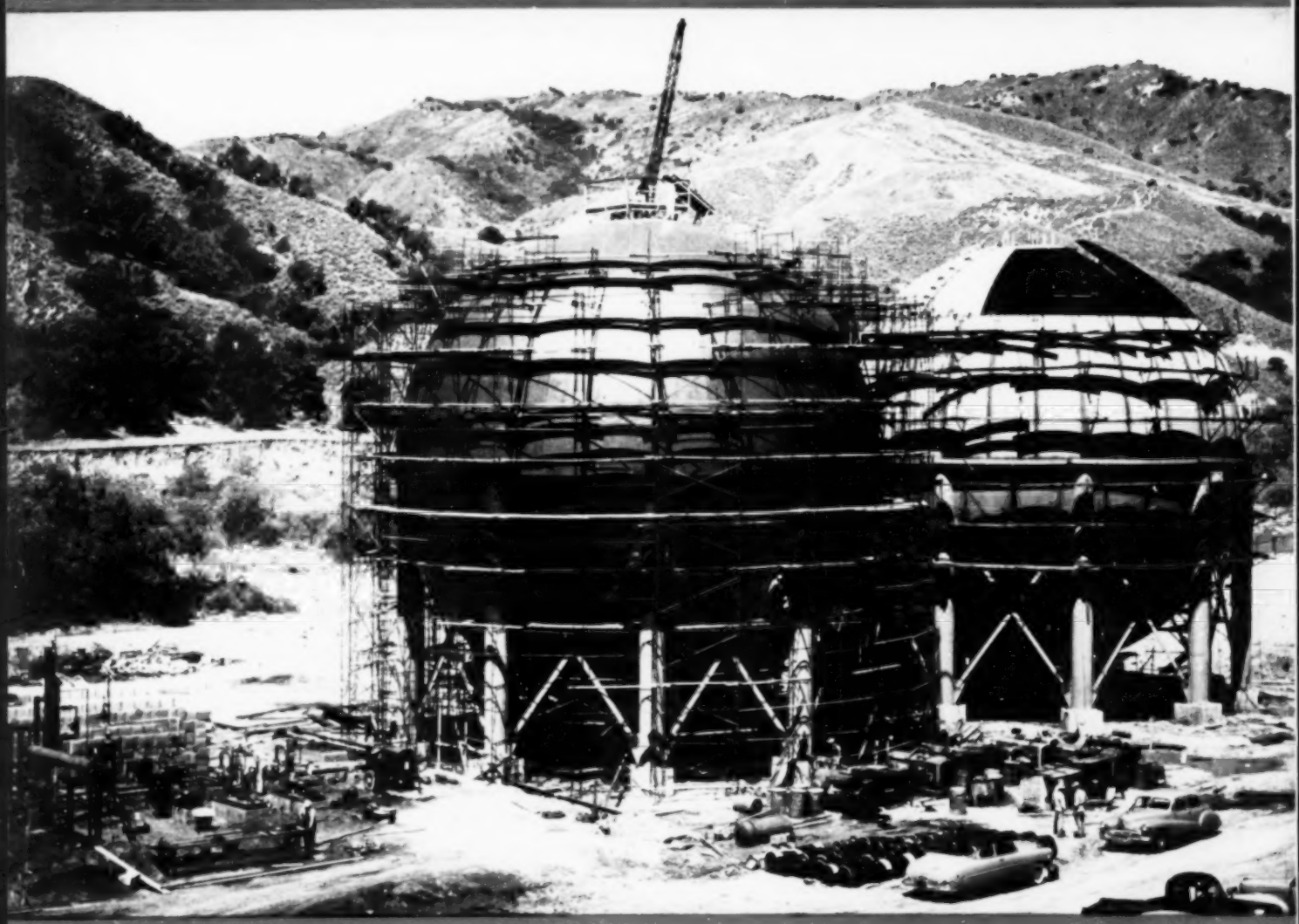
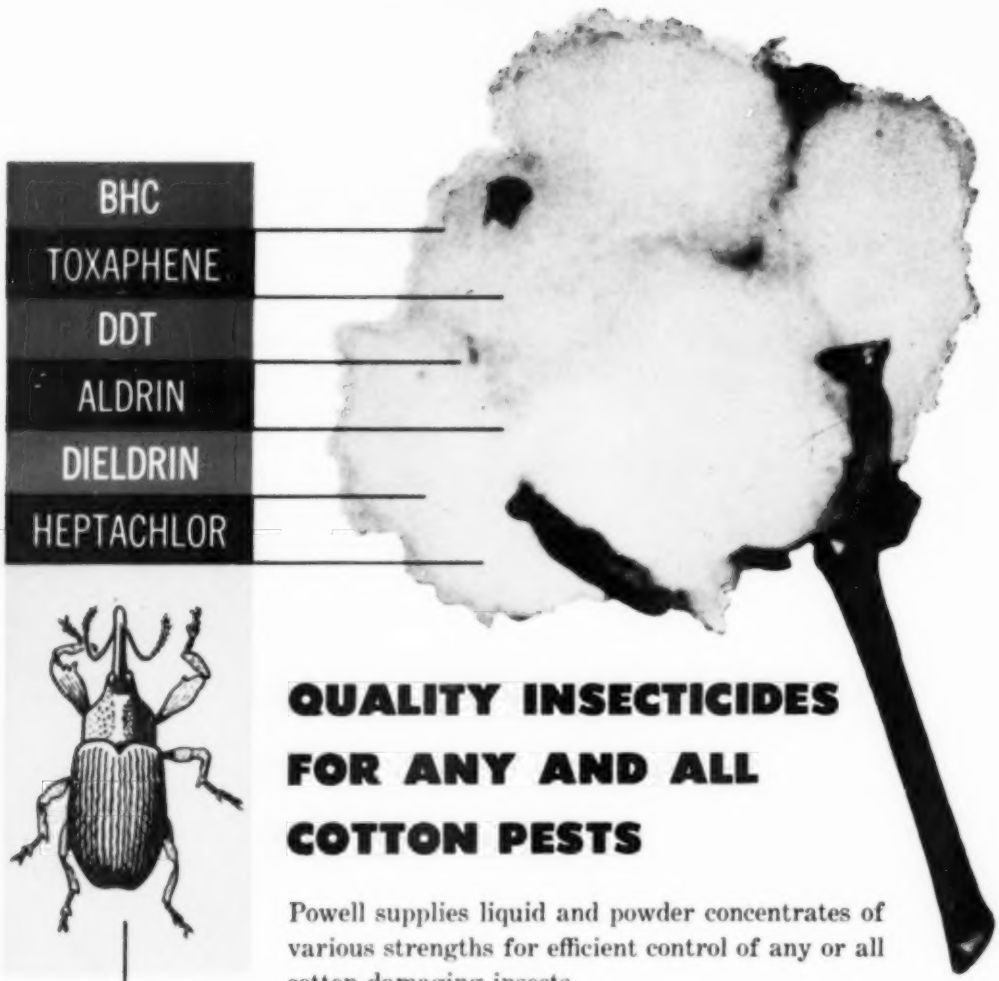
Vol. 8, No. 6 JUNE, 1953

AGRICULTURAL CHEMICALS



This Issue:

Annual U. S. D. A. Fertilizer Consumption Report • New Spray Equipment • Liquid Ammonia in Southwest Grain Protectant Merchandising • "Perthane" Announced • Fertilizer Industry & Wetting Agents • NFA Meets Calspray Asks Review of Decision • American Plant Food Council Meets • Minor Element Problems (Part II)



QUALITY INSECTICIDES FOR ANY AND ALL COTTON PESTS

Powell supplies liquid and powder concentrates of various strengths for efficient control of any or all cotton damaging insects.

Particularly popular is POWCO BRAND Cotton Dust Concentrate containing 9% gamma isomer of BHC plus 15% DDT, which cuts back to approved 3-5 finished cotton dust. Finely ground for ease in cut-back – free flowing and dry.

This – and all the other Powell performance-proved products are available at strategic points for fast delivery. Call sales office nearest you – now.

John Powell & Co., Inc.

ONE PARK AVENUE, NEW YORK 16, N. Y.

Sales Offices: Philadelphia • Pittsburgh • Chicago • Huntsville • Fort Worth • Omaha • San Francisco • Atlanta

Representatives in Principal Cities of the World

POWCO BRAND

KILLING POWER—THAT'S THE THING!

DDT • TOXAPHENE • BHC • CHLORDANE • LINDANE • ROTENONE • SABADILLA • PYRETHRUM & PYRIN • ANTU
PIPERONYL BUTOXIDE • ALLETHRIN • TEPP • PARATHION • ALDRIN • DILAN • HEPTACHLOR • 2, 4-D & 2, 4, 5-T.

LOOK TO POWELL...FOR CONSISTENT, TROUBLE-FREE QUALITY

These liquid toxicant formulators get bonus performance from Attaclay®...

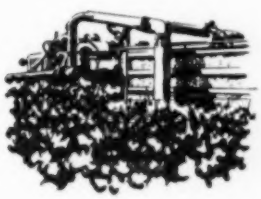
LOCATION: Texas

PRODUCT: 40% toxaphene dust base and wettable powder; 40% chlordane dust base

OWNER: *We use Attaclay "across the board"—making high and low concentration products for insect control on cotton, live stock, and the soil. We are constantly amazed at Attaclay's capacity to accept tough-to-handle liquid toxicants and deliver dry, free-flowing, lump-free products.*

LOCATION: Georgia

PRODUCT: chlordane and toxaphene cotton dust bases



SALES MANAGER: *My salesmen know all about Attaclay and what it does for our products. We consider this an important factor in selling our dust bases and wettable powders to distributors.*

LOCATION: Florida

PRODUCT: 40% chlordane dust base

PLANT MANAGER: *We went "all out" to cut carrier costs and ran into trouble in our grinding step following impregnation. Blamed the grinder people for the lumpy product we were getting. Their factory man flew down—gave his equipment a clean bill of health—and recommended a change to Attaclay. That was the answer . . . no trouble since.*

As a measure of over-all trade satisfaction, we estimate that better than three-fourths of the chlordane and toxaphene that goes into dust bases and wettable powders is formulated with Attaclay. Let's team up and put dependable Attaclay to work for you.

ATTAPULGUS Minerals & Chemicals Corporation

Dept. P, 210 West Washington Square, Phila. 5, Pa.

HERE'S HELP FOR YOU—a new 12-page booklet entitled "Road Map To Quicker, Easier and Better Pesticide Formulations Through Attaclay." Your free copy for the writing.

Her fingertips imagine the taste

The lady doesn't trust her eyes alone.

The buyer of Multiwalls is in much the same position.

Aside from package design, it's hard to tell one manufacturer's bag from another's simply by looking at it or fingering it.

Put the bags out of sight and you may be able to see many differences.

Men who buy 85 per cent of all Multiwalls consider* these intangibles more important than any other factor when they choose their supplier.

Invariably, these are among the first questions they ask . . .

"Is this company big enough?"

"Do they have a fair allocation policy?"

"Are their prices competitive?"

"Do they respect delivery dates?"

In a nutshell—

"Are they good people to do business with?"

We can't tell you what the answers are when these Multiwall users consider Union. This we do know . . . and the inference is yours to make—

In these days of industrial pressure, when *dependability* is a fervent wish as well as a word, men to whom Multiwalls are important are placing an increasing share of their orders with Union.

More so every day . . .

IT'S UNION FOR MULTIWALLS

TRADE MARK UNION

*August, 1931 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING

AGRICULTURAL CHEMICALS

A Monthly Magazine For the Trade

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THIS MONTH'S COVER:

These huge spheres, each with a capacity of 2,800 tons, are said to be the largest ever built for storage of liquified agricultural ammonia. They are part of the facilities of Shell Chemical Corporation's new ammonia plant being built at Ventura, California. The new plant, scheduled to produce more than 150 tons of NH_3 per day, will supplement the company's current production at Pittsburg, Calif. (See agricultural ammonia article, page 36, this issue)

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AGRICULTURAL CHEMICALS

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Entered as second-class matter November 4, 1949, at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

DDT

TECHNICAL DDT

DDT DUST CONCENTRATE

75% DDT WETTABLE POWDER

as you like it...

when you want it!

You say where and when. Michigan Chemical will be there with a fast, dependable supply of DDT, exactly as you want it.

Whether for compounding, packaging or direct application, DDT by Michigan Chemical is always of exceptionally high purity and uniformity. Write today for complete catalog of Michigan Chemical products including a wide choice of DDT concentrations and other agricultural chemicals.

michigan chemical corporation • ***Saint Louis, Michigan***

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New York 17, New York

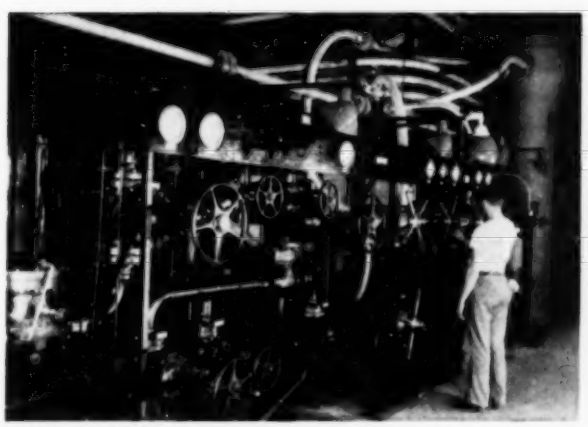
BASIC MANUFACTURERS OF INDUSTRIAL, PHARMACEUTICAL, AND AGRICULTURAL CHEMICALS

Since 1937 citrus and vegetable growers of Central Florida have looked to Fosgate Growers Cooperative for *Ace High* brand fertilizer. Located in the heart of the citrus belt at Orlando, this progressive cooperative offers growers many diversified services, including laboratory facilities for manufacturing specialized fertilizers to fit individual needs.

Abe Meer is manager of the Fertilizer Division of Fosgate Growers Cooperative.

Fosgate Growers Cooperative

...Another Spensol User



Millions of dollars worth of equipment is necessary to make SPENSOL (Spencer Nitrogen Solutions). Quality control plus dependable service has made SPENSOL the choice of America's finest mixers.

Got a production problem? Let our Spencer technical service staff help you find a solution. Even if you are not now a Spencer customer, there's no charge or obligation for this unusual Spencer service.

SPENCER®

SPENCER CHEMICAL COMPANY, Dwight Bldg., Kansas City 5, Mo.
District Sales Offices: Atlanta, Ga.; Chicago, Ill.; Memphis, Tenn.
Works: Pittsburg, Kans.; Henderson, Ky.; Chicago, Ill.; Vicksburg, Miss. (under construction)

America's Growing Name in Chemicals

Engineered for long, dependable service ...Top-quality materials and fabrication

UNITED STORAGE TANKS

Accessory Equipment Available from Stock

Anhydrous Ammonia Gas pumps, unloading compressors, valves and other accessories are carried in stock for quick delivery. Each item is backed by United's specialized experience and know-how in the Anhydrous Ammonia gas field.

United's Anhydrous Ammonia storage tanks are unexcelled for quality of materials and workmanship. Available in 30,000, 18,000 and 6,000 gwc. designs for 200 p.s.i. working pressure. Each tank is built to ASME specifications, and is Hartford (or equivalent) inspected. Tanks supplied will meet your state requirements. All fittings tested before shipment.

Fabricating points in Tennessee, Ohio, Pennsylvania and Illinois assure economical delivery to most areas east of the Rockies. Every United tank meets all national and state regulations and insurance requirements.

IT PAYS 10 WAYS TO DO BUSINESS WITH UNITED!

UNITED PETROLEUM GAS CO.

806 ANDRUS BUILDING • MINNEAPOLIS, MINN.

SALES REPRESENTATIVES IN:

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FARM MAGIC

Magic of man-made variety, used in the attainment of recent high crop goals, has wrought truly amazing results.

In the production of high grade red muriate of potash, one of the commodities most vitally needed by American farmers, Potash Company of America is helping the fertilizer industry bring about some of this farm magic.

POTASH COMPANY of AMERICA
Carlsbad, New Mexico

General Sales Office . . . 1625 Eye Street, N. W., Washington, D. C.
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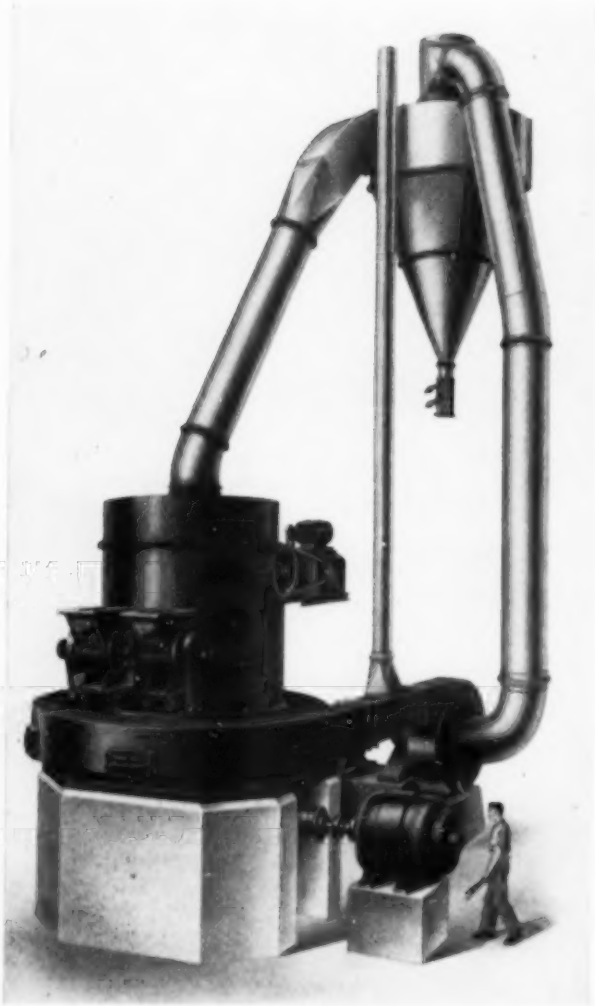
SINCE 1887

RAYMOND ROLLER MILLS

Preferred for over half a century

FOR PHOSPHATE ROCK GRINDING



RAYMOND Super Roller Mill for extra large production

More than two hundred Raymond installations in industry alone, handling all types of deposits, show how widely Raymond Roller Mills are accepted as standard units for producing phosphate rock for acidulation and direct application.

These mills have an outstanding record for economy of production, low operating and maintenance cost, ease of fineness adjustment, and dustless operation. These units make a compact, flexible installation, requiring a minimum of floor space, and they may be arranged to fit practically any plant layout.

Raymond Roller Mills are equally efficient for handling your insecticide powder production, involving regular field strength materials, high concentrates or sulphur.

If you have a grinding problem, Raymond equipment, experience and service will insure satisfactory results.

For complete details of the Roller Mill, write for Raymond Catalog # 69

COMBUSTION ENGINEERING – SUPERHEATER, INC.

1314 NORTH BRANCH ST.
CHICAGO 22, ILLINOIS

Raymond
PULVERIZER DIVISION

SALES OFFICES IN
PRINCIPAL CITIES

Easy-to-handle bag replaces bulky container!

Du Pont
ALATHON

Multi-wall bag, coated with "Alathon" for low moisture transmission, cuts packaging and shipping costs

"Ammate" ammonium sulfamate, a powdered weed killer, was previously packaged in bulky containers which were costly to ship and cumbersome to handle. The problem was to develop a package that would overcome these difficulties . . . and still provide adequate moisture protection for the highly hygroscopic contents.

The problem was solved with a multi-wall paper bag that has a 1½ mil coating of Du Pont "Alathon" polyethylene resin on the inside and an outer ply of 60# wet strength kraft. The 75-pound-capacity bag has waxed seams top and bottom and a valve sleeve which is heat-sealed after the bag is filled. In service for over a year, this new bag has reduced packaging and shipping costs . . . is easier to handle . . . and provides such excellent moisture protection that the weed killer can be stored in humid climates without danger of product deterioration.

Perhaps "Alathon" polyethylene resin—with its unique combination of properties—can help you solve a special problem. "Alathon" is tough and flexible over a wide range of temperatures—from tropical heat to 70° below zero . . . resists most greases, acids and alkalies . . . is tasteless, odorless and non-toxic. Consider using it in multi-ply or single-ply bags, pouch bags, chipboard containers and trays, fiber drums and cartons.

*REG. U.S. PAT. OFF.

DU PONT
REG. U.S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY
Polychemicals
DEPARTMENT
PLASTICS • CHEMICALS

WRITE FOR FREE BOOKLET

describing the properties and uses of "Alathon" in the packaging field, or simply mail this handy coupon. We'll gladly put you in touch with sources of supply for packaging materials coated with "Alathon."

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Dept. 556, Du Pont Bldg., Wilmington 98, Del.

Please send me the new booklet on packages using coatings of "Alathon."

Check type of package most interested in: Multi-wall bags ( ), Single-ply bags ( ), Pouch bags ( ), Fiber drums & cartons ( ), Chipboard containers & trays ( ), Overwraps ( ), Other ( ).

*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

Cut fertilizer curing time up to 90%

Fertilizer bag on right uses Santomerse No. 1. Bag on left does not.

Reduce hardening in bin and bag with SANTOMERSE No. 1

The proved wetting agent for use in fertilizer manufacture.
Minute amounts of Santomerse No. 1 can make remarkable improvements in your mixed goods:

Cuts curing time 27 days . . . records show numerous instances where curing time has been reduced from 30 to 3 days, thanks to a quicker, more *thorough* reaction with Santomerse No. 1.

Reduces hardening in bin and bag . . . many times you no longer have to use dynamite in bin. Light in density, Santomerse No. 1 readily disperses through product and decreases caking.

Stops "salting-out" . . . wetting action of Santomerse No. 1 prevents formation of large needle-like crystals on surface of mix.

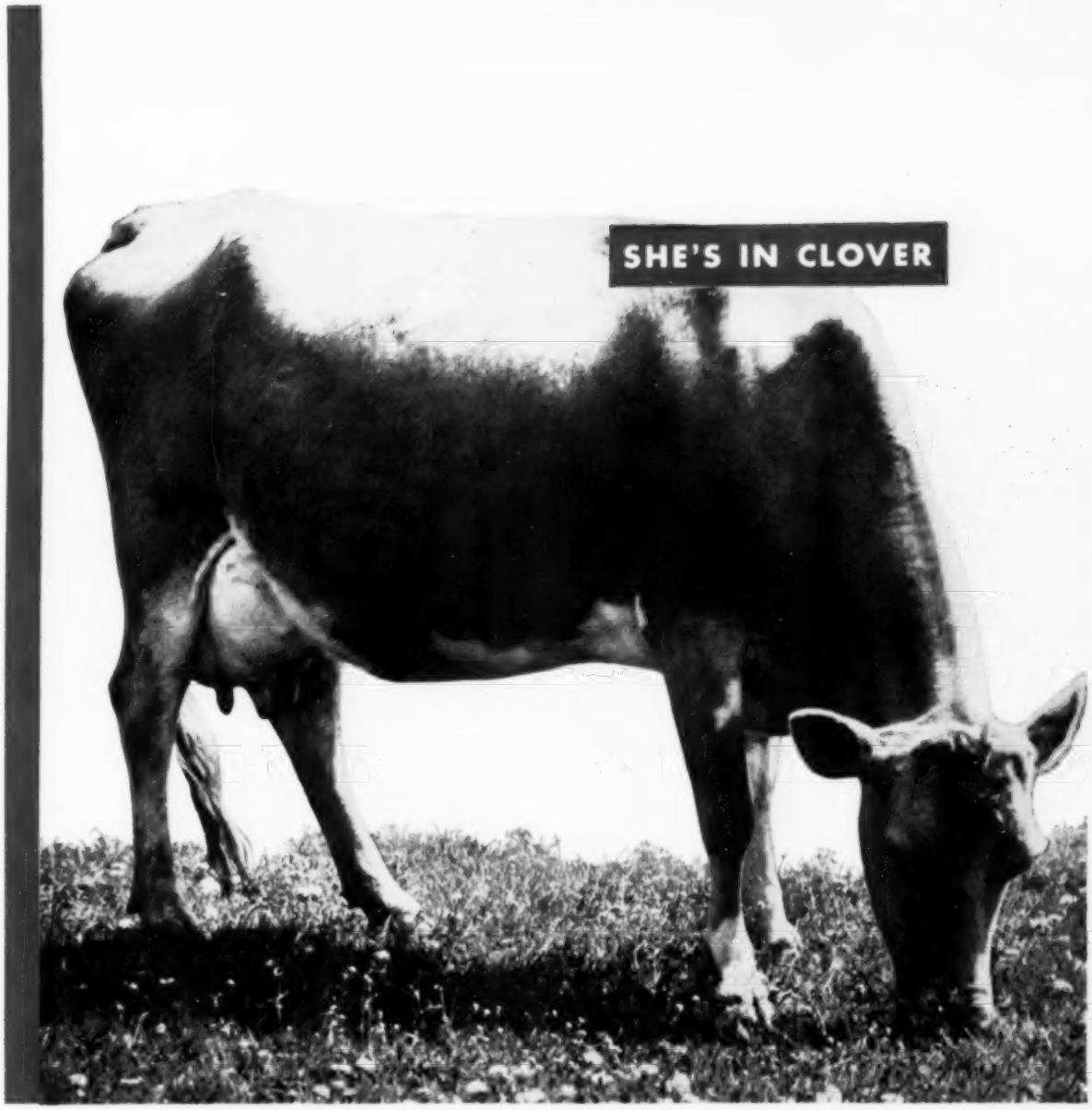
FOR COMPLETE INFORMATION on this application contact your nearest Monsanto Sales Office. Monsanto worked closely with the *original developers* of this technique. It has a fund of experience *unmatched* by any other producer on this subject. If more convenient write to MONSANTO CHEMICAL COMPANY, Phosphate Division, 1700 South Second Street, St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle, Twin Cities. In Canada, Monsanto Canada Limited, Montreal.

Santomerse: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS—PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND



SUNSHINE STATE POTASH
A PRODUCT OF NEW MEXICO U.S.A.
REG. U. S. PAT. OFF.

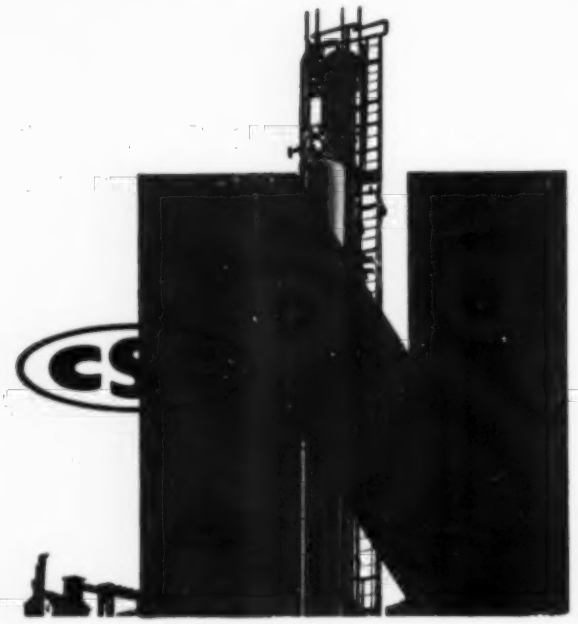
HIGRADE MURIATE OF POTASH 62/63% K_2O
GRANULAR MURIATE OF POTASH 60% K_2O MIN.
MANURE SALTS 20% K_2O MIN.

She's a prime, healthy animal in her peak producing years. Her milk is rich and creamy. She proves a good investment because she produces day in and day out.

The secret of her profit-making lies in the soil, ultimate source of all animal and vegetable growth. Every day vital plant-food elements are drained from the land to supply her with rich, nourishing fodder. Fertilizers help restore these elements.

Many of the most effective fertilizers, in replenishing the soil and strengthening crop resistance to disease and drought, contain POTASH, often Sunshine State Potash from New Mexico. POTASH is a valuable profit-producing aid for farmer and businessman.

UNITED STATES POTASH COMPANY, Incorporated, 30 Rockefeller Plaza, New York 20, N. Y.



itrogen expansion program completed NOW

Last year's blueprints are reality. We're now supplying the fertilizer industry with twice as much nitrogen as before from CSC's big Dixie Plant in Louisiana.

Completion of this important project firmly establishes CSC, for the years ahead, as one of the leading, basic, big-tonnage sources of nitrogen *in its three key forms.*

The fertilizer trade is now taking all the N we can make—Anhydrous Ammonia, Nitrogen Solutions, and Ammonium Nitrate.

CSC Ammonium Nitrate is a new, crystalline product made by the unique Stengel Process, developed in CSC's research laboratories. Sold under the brand name, CSC Ammonium Nitrate Fertilizer, it is going to the farmer thru leading fertilizer manufacturers.

AGRICULTURAL CHEMICALS DIVISION

COMMERCIAL SOLVENTS CORPORATION

260 Madison Avenue, New York 16, N. Y.

ANHYDROUS AMMONIA • NITROGEN SOLUTIONS • AMMONIUM NITRATE
BENZENE HEXACHLORIDE • DILAN® • ETHYL FORMATE • METALDEHYDE

NEW WEED KILLER ALANAP*-I

Drastically cuts cost of hand weeding of vine crops

THE United States Rubber Company's Naugatuck Chemical Division has now developed a remarkably effective pre-emergence herbicide which kills weeds as they start to sprout or before they emerge from the ground. Named Alanap-I, it effectively controls such weeds as pigweed, purslane, lambsquarter, quickweed, ragweed, foxtail and crabgrass.

Presently available to growers, Alanap-I considerably reduces the cost of tedious hand weeding and crop cultivation. One grower reports complete elimination of hand weeding in squash, cucumber, pumpkin, cantaloupe and watermelon, and a saving of more than $100.00 per acre.

Advantages

Under normal soil conditions, Alanap-I maintains excellent weed control for a period of 3 to 8 weeks, even after heavy rains. Alanap-I is non-hazardous to handlers, warm-blooded animals and vine crops. It is easy to apply and reasonably priced.

When To Use

Alanap-I can be used for a pre-emergence weed control by spraying soil surface up to 48 hours after planting. A post-emergence spray may be used after vine crop has emerged but before weeds have emerged. To insure maximum weed control, soil clods should be eliminated.

Now Available

At the present time, Alanap-I is specifically recommended for use in New England, New York, Pennsylvania, Delaware, New Jersey, Ohio, Indiana, Michigan, Illinois, Minnesota, Wisconsin, Iowa and Missouri. Other states will have the unique benefits of Alanap-I after more extensive field tests have been completed.

"ALANAP" Promising on Other Crops

Further testing on cotton, soybeans, peanuts, lima beans and asparagus may allow wider uses in 1954.

ALANAP-I Made This Big Difference

On the left, weeds have nearly choked out this untreated row of young cucumber plants at Associated Seed Growers weed control test plots. Row in right photo was treated at 4 lb. Alanap-I per acre immediately after planting cucumber seed.

*U. S. Pat. No. 2,556,665

Advise local supplier of your needs beforehand to insure availability. For further information write for Bulletin No. 16

UNITED STATES RUBBER COMPANY

Naugatuck Chemical Division, Naugatuck, Connecticut

manufacturers of seed protectants—Spergon, Spergon-DDT, Spergon-SL, Spergon-DDT-SL, Phygon Seed Protectant, Phygon Nuggets, Phygon-XL-DDT, Thiram Nuggets, Thiram 50 Dust—fungicides—Spergon Wettable, Phygon-XL—insecticides—Synklor-48-E, Synklor-50-W—fungicide-insecticides—Spergon Gladiolus Dust, Phygon Rose Dust—miticides—Aramite—growth retardants and herbicides—MH-30, MH-40—pre-emergence weed killers—Alanap-I.

Formulators & Dust Mixers..

Now...Get Your TDE DDD Requirements From GENERAL CHEMICAL

...the "one-stop" source for all your important Base Materials & Toxicants

With full-scale commercial production of TDE (DDD) at its Marcus Hook, Pa., plant, General Chemical has provided formulators with a reliable new source of this increasingly important organic insecticide.

Now you can obtain your TDE technical and dust base requirements from the *same* producer which has long been a major supplier of DDT, Arsenicals, BHC, Lindane, Potassium Cyanate and other base materials for agricultural insecticides, fungicides and herbicides.

For your TDE needs—or for any of the other toxicants listed here—write or phone any of General Chemical's offices located from coast to coast.

TDE (DDD)
Technical, Flake
Dust Base (50% TDE)

DDT
Technical, Flake or Granular
Dust Base, 50% & 75%

BHC
Technical (15%, 36% & 90% Gamma)
Dust Base, 12% Gamma

LINDANE
Technical
Dust Base, 25%, 75%, 95%
Emulsifiable Concentrate, 20%
Oil Concentrate 20%

ORGANIC MITICIDES
"Aramite"
Genite* 883 (p-chlorophenyl p-chlorobenzene sulfonate)
Genite 923 (2,4-Dichlorophenyl Ester Benzene Sulfonic Acid)

LEAD ARSENATE
Standard
Astringent
Basic

CALCIUM ARSENATE
Standard
Low Lime

PARATHION
Dust Base, 25% Emulsifiable, 2 & 4 lbs. per gallon

FERBAM
Dust Base (76% Ferric Dimethyl Dithiocarbamate)

ZIRAM
Dust Base (76% Zinc Dimethyl Dithiocarbamate)

2,4-D
Acid, and Technical Esters

2,4,5-T
Acid, and Technical Esters

TCA · SODIUM SALT
90% Dry Powder
50% Liquid Concentrate

POTASSIUM CYANATE
Technical
Cotton Defoliant
Weed Killer

DINITRO
Pre-Emergence Herbicides

CHLORO IPC
Pre-Emergence Herbicide

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GC
Allied Chemical

Agricultural Chemical Department
GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
Serving Agriculture from Coast to Coast

10-10-10 fertilizer produced up to 132.4 bushels of corn in dry growing season

Farmers interested in big corn yields from run-down land can take a tip from Andrew Cross of Letart Falls, Ohio.

In 1952, he put an excellent 10-10-10 fertilizer program into effect on his newly-purchased farm. It included 600 pounds per acre of 10-10-10 plowed down, an additional 300 pounds at planting time and 50 pounds of nitrogen as side dressing. The result, in spite of rainfall four inches under normal, was yields up to 132.4 bushels per acre on relatively good land, and 89 to 111 bushels on land that had been left idle for 30 years as unprofitable.

This spring, Mr. Cross is applying 1000 pounds of 10-10-10 at plowing time and is looking forward to even better yields than in 1952.

Bigger yields for farmers mean better business for you

MR. CROSS embarked on his 10-10-10 program last year at the suggestion of a representative of a fertilizer manufacturer. His excellent results meant a good sale to him in 1953. You can build a profitable business in high-nitrogen fertilizers through just such an approach. It will pay off handsomely in years to come.

Be sure your high-nitrogen fertilizers are produced to give the finest performance, and that means U·S·S Ammonium Sulphate for the nitrogen content. This dry, free-running material mixes readily, won't set up in storage and behaves well in drills and other distributing equipment.

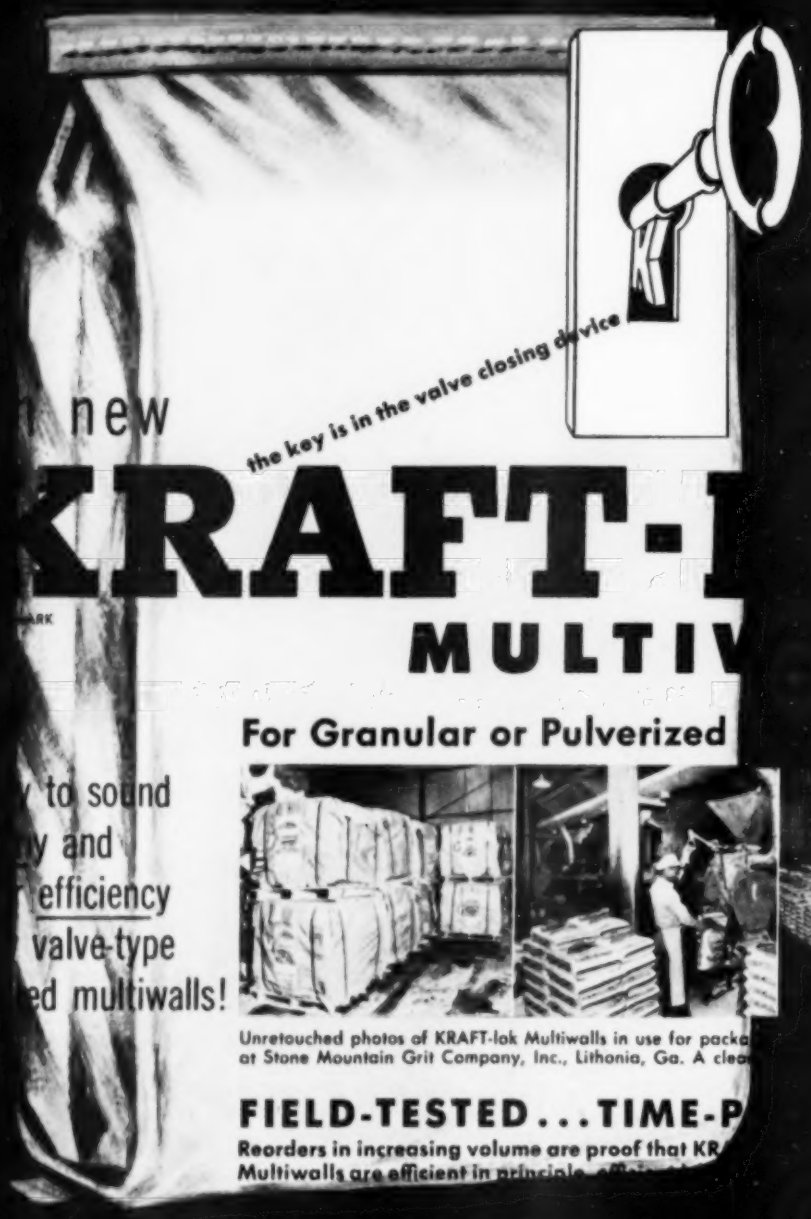
For complete information on U·S·S Ammonium Sulphate, contact our nearest Coal Chemical sales office or write directly to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

U·S·S AMMONIUM SULPHATE

USS

UNITED STATES STEEL

FILL BETTER, CLEANER!
CLOSE TIGHTER, FASTER!
SPEED UP PRODUCTION...SAVE DOLLARS!



Unretouched photos of KRAFT-lok Multiwalls in use for packa
at Stone Mountain Grit Company, Inc., Lithonia, Ga. A clea

FIELD-TESTED...TIME-P
Reorders in increasing volume are proof that KR
Multiwalls are efficient in principle

Gilman PAPER CO.

KRAFT BAG CORPORATION

3 Generations of Bag Specialization

AS WE GO TO PRESS . . .

Roth Velsicol Sales Mgr.

Dr. Roger W. Roth has been made sales manager of the Agricultural Chemicals Division of Velsicol Corp., Chicago. Before joining Velsicol, he was with the Agricultural

DR. ROGER W. ROTH

Chemicals Division of Commercial Solvents Corp., supervising sales development of agricultural pesticides, and previously was with Bell Aircraft Corp., where he was responsible for the development of the helicopter for agricultural purposes.

A graduate of the New York State College of Forestry at Syracuse, N.Y., he received his doctorate at Cornell University, majoring in economic entomology.

George W. Suave is a recent addition to the Velsicol sales staff, assigned to the western territory. Until recently he was supervising entomologist and cotton gin manager with Boston Land Co. of California.

Howard S. Beaudoin has also been added to the western territory sales staff, with headquarters in Denver. He has been State Entomologist in Wyoming.

•

Summers Sioux Falls Plant

Summers Fertilizer Co., Baltimore, has announced completion of plans for the erection at Sioux Falls, S. D., of its tenth fertilizer manufacturing plant with a seasonal capacity of 25,000 tons of mixed fertilizers. A ten-acre site on the C&NW Railroad was purchased several months ago. It is expected the plant will be in operation early October, 1953. This will be the first manufacturing plant in the State of South Dakota to produce modern high test fertilizer mixtures. Designed to withstand a variety of climatic conditions prevailing in the area, it will be of laminated arch type construction, 300 ft. long with 100 ft. span and piling height of 30 ft. The Stedman Foundry & Machine Company has been awarded contract for the equipment. The plant was designed by Summers' own engineers.

The Sioux Falls plant is one of a series of four which Summers plans to erect in the Midwest, the others being at Taylorville, Illinois; Portland, Indiana, and Sarnia, Ontario.

Management of the Sioux Falls plant will be under the direction of W. A. Stolt who, for the past several years, has been in charge of Summers' Grand Forks, North Dakota, plant.

•

Border Fertilizer Co.

Benedict Fertilizer & Supply Co., El Centro, Calif., changed its name to Border Fertilizer & Supply Co. on June 1. Same ownership and personnel continue to direct the company activities. B. J. Cannon is general manager.

•

Utah Chem. to Build

Utah Chemical Co. will shortly construct a nineteen million dollar ammonia plant in south central Utah. N. G. Morgan, Jr., president of the company, heads a group of Salt Lake City businessmen who are behind the new firm.

•

New Florida Pesticide Law

Both houses of the Florida legislature have passed a bill to place manufacture and sale of insecticides under regulation by the state agricultural commissioner. Annual registration is required, and the new law sets up labeling requirements and establishes registration fees.

The bill, at press time, was awaiting signature by the Florida Governor, and was expected shortly to become law.

•

Grace Acquires Thurston Chem.

WILLIAM R. THURSTON

W. R. Grace & Co. has just acquired the business of the Thurston Chemical Co. Thurston Chemical Co. is a manufacturer of superphosphate fertilizers and mixed commercial fertilizers in Missouri, Kansas, Oklahoma, Iowa, Arkansas, Illinois, Minnesota, and Nebraska. Plants are located in Atlas and Trenton, Mo., West Tulsa, Okla., and Lawrence, Kans.

William R. Thurston, president of Thurston Chemical Co., will become president and director of Naco Fertilizer Co. (West Virginia), a subsidiary of W. R. Grace & Co. Naco headquarters, now located in New York, will be moved to Joplin, Mo. Naco manufactures mixed fertilizers, sulfuric acid, superphosphate and concentrates, and blends insecticides for agricultural purposes.

•

Dismiss Fluffium FTC Case

A Federal Trade Commission hearing examiner has ordered dismissal of an FTC complaint against Henry A. Dreer, Inc., Phila., alleging false and misleading advertising of the company's liquid soil conditioner, "Fluffium". No useful purpose would

be served by continuing the action, it was considered, since the company has become bankrupt and its assets have been acquired by another firm.

•

New Mo. Fertilizer Plant

Missouri Farmers Association, Columbia, Mo., has just announced the awarding of a contract to Merritt-Chapman & Scott Corp., New York, for construction of a new three and a half million dollar chemical fertilizer plant to be built near Joplin, Mo. The new plant, designed by Dorr Co., Stamford, Conn., architect-engineers for the project will produce about 70,000 tons of mixed fertilizer a year.

The Missouri Farmers Association is both a State-wide farm organization and a federation of farmer-owned co-operatives. It has more than 146,000 members, and currently owns and operates fertilizer plants at Maryland Heights, Mo., and Springfield, Mo.

•

Liquid Fertilizer Warning

The Association of American Fertilizer Control Officials issued a warning early in June against fallacious claims being made by some manufacturers of liquid fertilizers designed for home garden use. The warning was promptly supported by the National Fertilizer Association which issued a similar statement. "The people should not be misled by the advertising now being blatantly and widely promoted," said the two statements. "Commercial fertilizers, liquid or dry, are of great benefit toward improving the productivity and quality of vegetables and flowers raised by the home gardener, but many of the statements currently being made about some liquid fertilizers contain absolute misrepresentations of fact."

Among the claims being made for liquid fertilizers, to which objection is raised, are the claims that liquid fertilizers are more economical than other fertilizers, that they are superior to dry fertilizers in promoting plant growth, that they achieve instantaneous favorable results, and that they contain valuable radioactive materials.

Combinations for Cotton Pests

Cotton pests such as the pink bollworm, boll weevil, cotton aphid, bollworm, cotton leafworm, and spider mites, may be controlled by spray combinations of DDT with methyl parathion or metacide, according to a recent release issued by the U. S. Department of Agriculture. Large-scale spray tests in the Lower Rio Grande Valley in 1952 indicate that the DDT-methyl parathion or metacide combinations may give effective control. With no single insecticide now available that will control all of the principal cotton pests, attention in the Rio Grande Valley experiments was focused on finding combinations of two insecticides that would do the job.

In one field sprayed with DDT and methyl parathion combined, a gain of 1,600 pounds of seed cotton per acre was obtained over the untreated area. Dieldrin was added to the other materials in some of the final applications to provide better control of the heavy, late-season migrations of the boll weevil. Methyl parathion in combination with DDT appeared slightly more effective against the boll weevil than the metacide-DDT combination. All tests were carried out by USDA's Bureau of Entomology and Plant Quarantine in cooperation with the Texas Agricultural Experiment Station.

•

Deactivator for Pesticides

"Maracarb N," a new humectant developed by the Chemical Division of Marathon Corp., Rothschild, Wis., is reported to show considerable promise as a catalyst deactivator in pesticide powders and dusts. Some agricultural chemicals, particularly chlorinated hydrocarbons, are susceptible to decomposition either during or after formulation. Often this decomposition is attributable to the so-called catalytic activity of the carrier or diluent used in the formulation. Laboratory tests have shown Maracarb N to be effective in nullifying catalytic activity, thereby prolonging shelf-life of the toxicants, company investigators have reported.

Maracarb N is a liquid product, having a concentration of approximately 50% solids. Laboratory and pilot plant quantities are available for immediate trial. Further technical information may be obtained from Marathon Corp. Chemical Division, Rothschild, Wisconsin.

•

Morrison Leaves Summers

Summers Fertilizer Co., Baltimore, has announced the resignation of K. D. Morrison, vice-president and sales manager, effective June 1.

•

Wilson Grace Chem. Chm'n.

Charles E. Wilson, formerly president of General Electric Co. and later chairman of the Defense Mobilization Board and vice-chairman of the War Production Board, has been elected chairman of the board of directors of Grace Chemical Co. He is also chairman of the executive committee of the board of directors of W. R. Grace & Co., parent company of Grace Chemical. Grace Chemical Co., formed a year ago, now has under construction its first manufacturing unit, a $19 million nitrogen plant located near Memphis. The plant is expected to be on stream in about a year.

•

Agree on Fertilizer Wages

The five leading potash producers operating in the Permian Basin potash field at Carlsbad, N.M., have signed wage agreements with three unions involved in contract negotiations. Wage rates are up 22¢ an hour under the new agreement, including 18¢ previously agreed to under a cost-of-living escalator clause, plus an additional 4¢ an hour.

Major phosphate producing companies in the Polk County, Fla., phosphate fields have also signed with ICWU locals. Wage increases given ranged up to 4¢ an hour. In some cases they were accompanied by other fringe benefits.

With these two major settlements concluded, it should be possible to anticipate a steady supply of these important two fertilizer raw materials over the coming twelve month period, uninterrupted by any major strikes.

EFFECTIVE
CONTROL FOR
COTTON BOLL WEEVILS

Here's new, proven control of boll weevils and other bothersome costly cotton insect pests. It's new Heptachlor, fully approved for cotton insects by the Federal Government and cotton-raising states. So powerful, you'll be surprised how little you have to use to do an effective job . . . on boll weevils as little as four ounces to the acre per application. And such applications control a wide variety of other cotton insect pests at the same time. Heptachlor is also tops in economy.

Easy, too. Heptachlor can be applied in wettable powders, emulsifiable concentrates or free-flowing dusts. So, for an easier, bigger cotton yield, get Heptachlor, the more economical cotton insect toxicant. Contact your dealer, county agent, or write to us right away for complete facts and information about Heptachlor.

VELSICOL CORPORATION

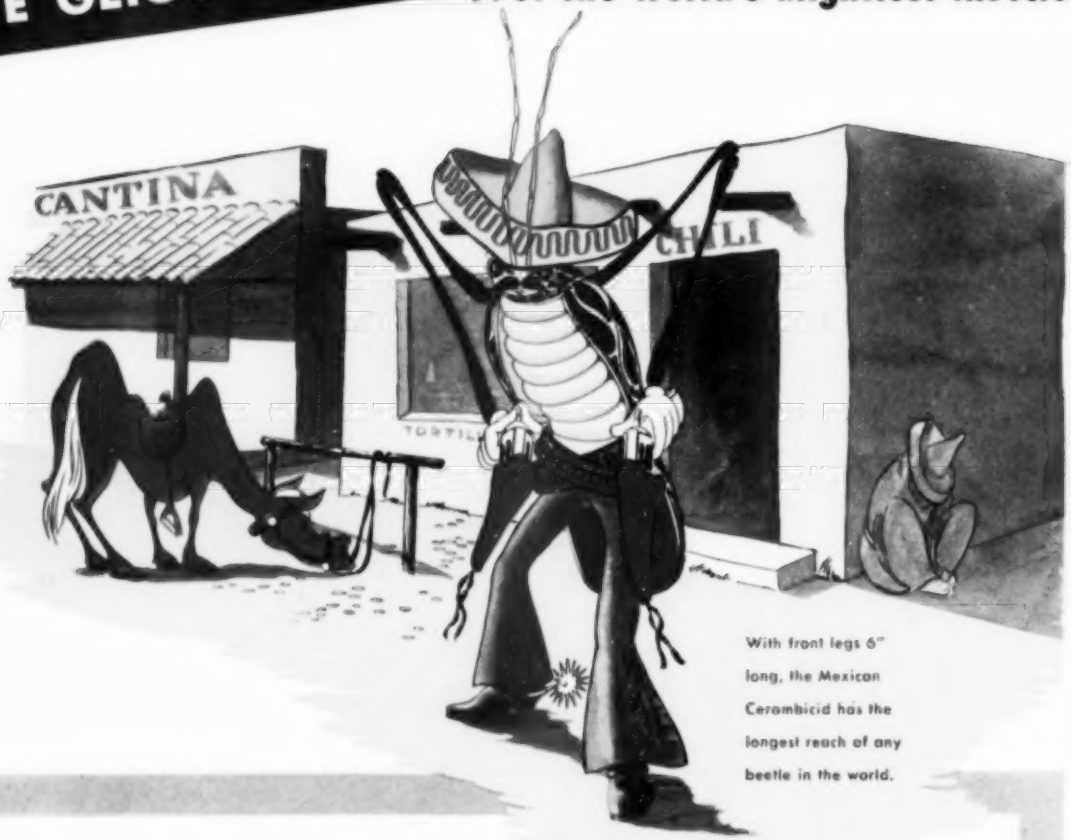
General Offices and Laboratories
330 E. Grand Ave., Chicago 11, Ill.

Export Division
100 E. 42nd St., New York 17, New York

REPRESENTATIVES IN PRINCIPAL CITIES

THE GEIGY GALLERY

..of the world's mightiest insects



With front legs 6" long, the Mexican Cerambicid has the longest reach of any beetle in the world.

mexican cerambicid VS. the aphid

The Mexican Cerambicid has a boarding house reach, a Pancho Villa swagger and his favorite expression is "Smile when you say that, stranger". And gringo, if you should ever feel his antenna probe the short hair on the back of your neck don't just stand there. Jump right out of your shirt and make tracks to another part of town.

Ah, but the Aphid. You need not fear this spectacular eater—not so long as you are equipped with Geigy insecticides. No matter where you find this pest—in the vegetable fields, cotton fields or orchards—there is a Geigy product specifically designed to control him economically and effectively.

In fact, no matter what your pest problem, depend on Geigy's complete line of agricultural chemicals.

ALDRIN • ARAMITE* • ARSENICALS • BHC • CARBAMATES • CHLORDANE • COPPER • DDT
DIELDRIN • HERBICIDES • LINDANE • MALATHON • METHOXYCHLOR • PARATHION • PCP • SEED
DISINFECTANTS • TDE (DDD) • TEPP • TOXAPHENE

*Trademark U. S. Rubber Co.

ORIGINATORS OF Geigy DDT INSECTICIDES

GEIGY COMPANY, INC. 89 BARCLAY STREET, N. Y. 8, N. Y.

☆Dustless Dry Grinding!
☆Non-Clog Wet Grinding!

For Finenesses of 100 to 325 Mesh

WILLIAMS
HELIX-SEAL HAMMER MILLS

Combining All The Advantages Of An Efficient Hammer Mill With A Closed-Circuit Screw Type Feed

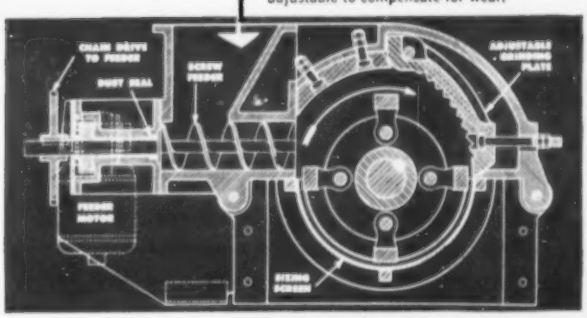
Cleaner, Safer Dustless Dry Grinding
The closed screw feed prevents the uncontrolled inrush of air into the mill and assures cleaner operation, guards against health, fire or explosion hazards, and greatly reduces housekeeping expense.

Non-Clogging, Accurate Wet Grinding
The reduction and sizing of sticky, wet or oily products is efficiently controlled by the screw feeder. Materials will not clog or ball up the mechanism.

No Separators, Fans Or Cyclones
Ground materials are discharged completely pulverized without tailings or oversize products to be separated. Collectors, fans or separators are entirely unnecessary.

Inexpensive, Easy Installation
The small floor space, the elimination of vibration, and the need for only a simple sealed bin or chute, keeps the easy installation of a Helix-Seal Mill very economical. No costly, cumbersome equipment is required.

Low-Cost Maintenance
The interior of a Helix-Seal Mill is completely accessible for fast, easy cleaning, by quick brushing for most materials. Extra rugged construction and simple design promise the very minimum in upkeep and service.



Cross section of Helix-Seal Mill showing long grinding plate over which material must pass before falling to sizing screen. Grinding plate is adjustable to compensate for wear.

OTHER WILLIAMS EQUIPMENT

HAMMER MILLS in many types and sizes for any requirement . . . ROLLER and IMPACT MILLS for fine grinding, even to micron sizes . . . DRYER MILLS for grinding wet materials down to 400 mesh . . . AIR SEPARATORS . . . VIBRATING SCREENS . . . COMPLETE PLANTS for installation in existing buildings.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
2707 N. BROADWAY ☆ ST. LOUIS 6, MO.

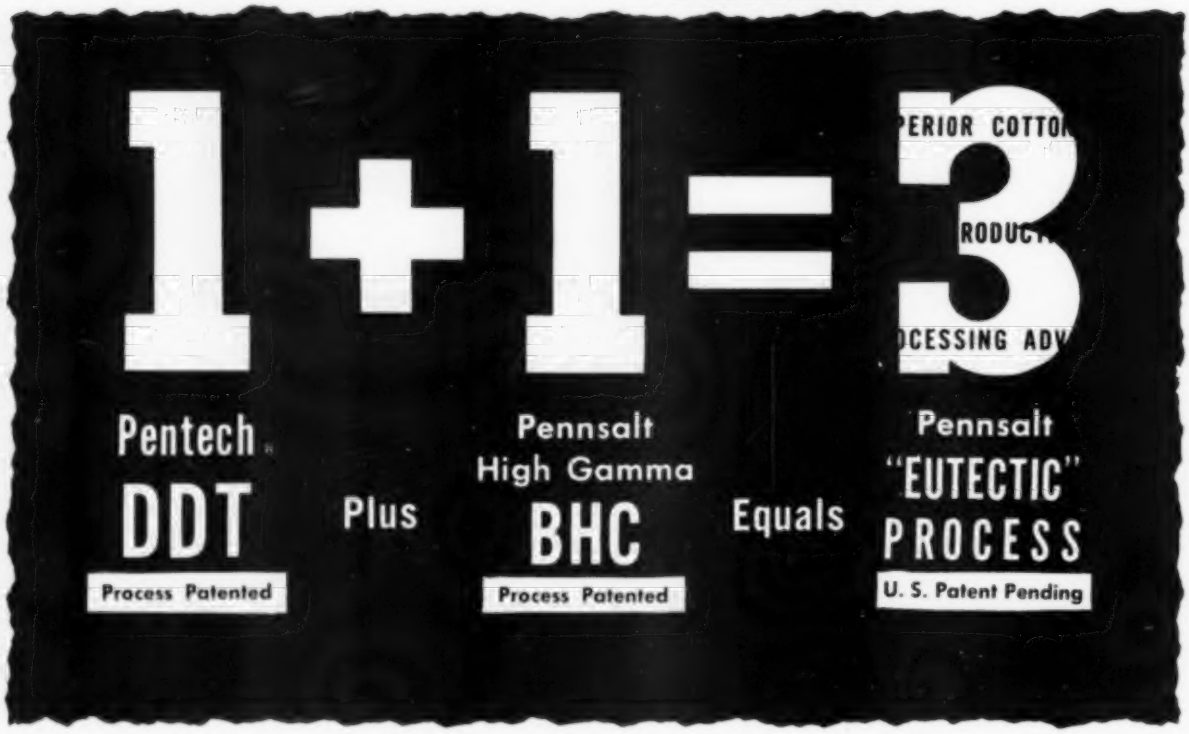
Ask For Brochure

WILLIAMS

CRUSHERS GRINDERS SHREDDERS

OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD

With Pennsalt's Original EUTECTIC Method



PENNSALT now offers formulators a unique improved technique for the preparation of highly effective, uniformly impregnated BHC-DDT dusts. It's called the "Eutectic" Method because the two components together have a melting point lower than BHC and DDT individually.

This means less heat need be applied to melt the BHC and DDT. Once melted, the mix is well adapted to volumetric measurement or rapid, accurate weighing methods—ideal for high production. Another property of this mixture is that it will super-cool—will not solidify at room temperature for at least 24 hours. It can, therefore, be stored for a limited time, be readily pumped, and need not be reheated.

Furthermore, Pennsalt's BHC-DDT "Eutectic" mixture remains liquid long enough to permeate *entirely* the whole mass of the absorbent carrier—resulting in a dust of exceptional uniformity.

This advanced "Eutectic" Method is made possible by Pennsalt's own high-gamma BHC. It contains approximately 36% of the gamma isomer, and has far different physical properties. It saves you handling costs, and enables you to produce higher quality dusts.

Equipment for this technique need not be complex (your present equipment may be adapted), and Pennsalt engineers and specialists will give you technical assistance. For further information, contact the Pennsalt office nearest you today.

Use the exclusive Pennsalt "Eutectic" Method —for the finest BHC-DDT dusts!

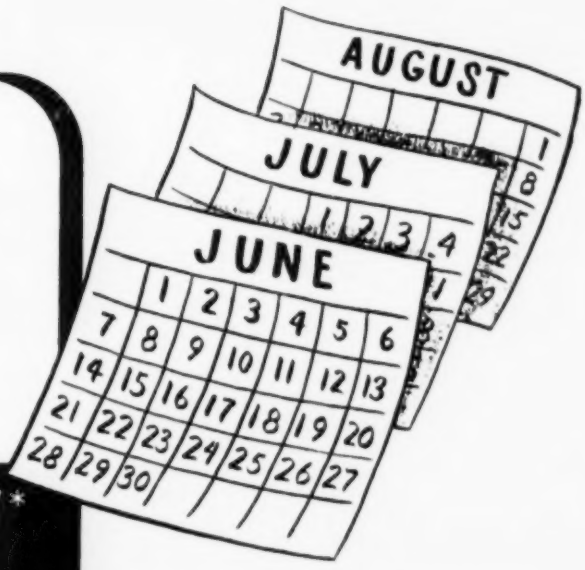
Pennsylvania Salt Manufacturing Company

PHILADELPHIA 7, PA.

Tacoma, Wash. Bryan, Tex. Montgomery, Ala. Los Angeles and Berkeley, Calif. Portland, Ore.

Pennsalt Chemicals

Now is the time
to see for yourself how



Nacconol*
THE LOW-COST CURE ACCELERATOR

can save you time and money in the months to come!

AS LITTLE AS ONE-POUND
Nacconol*
PER TON OF FERTILIZER

1. **Assists in keeping finished fertilizer free-flowing —in the bag and in the curing bin**
2. **Avoids the regrinding of lumped bagged goods**
3. **Substantially reduces curing time**
4. **Breaks the bottleneck of curing-bin capacity**

NATIONAL ANILINE DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N.Y. • BOwling Green 9-2240

Boston 14, Mass., 150 Causeway St.	Capitol 7-0490	Richmond 19, Va., 8 North Fifth St.	Richmond 2-1920
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Philadelphia 6, Pa., 200-204 S. Front St.	LOmbard 3-6382	Greensboro, N.C., Jefferson Standard Bldg.	GReensboro 2-2518
San Francisco 5, Cal., 517 Howard St.	SUtter 1-7507	Chattanooga 2, Tenn., James Building	Chattanooga 6-6347
Portland 9, Ore., 730 West Burnside St.	Beacon 1853	Atlanta 2, Ga., 254 E. Paces Ferry Rd.	EXchange 3594
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Charlotte 1, N.C., 201-203 West First St.	CHarlotte 3-9771	Toronto 2, Canada, 137-143 Wellington St. W.	Empire 4-6495

*Reg. U.S. Pat. Off.

Now, during the less-active summer months, is your opportunity to find out just how much time and money Nacconol can save in your operations.

Here's how Nacconol works:

As little as one pound of Nacconol per ton of finished goods, accelerates the reaction between the superphosphate and the ammoniating solution . . . causes the batch to cure in much shorter time. And because the cure is more complete, "mixed-goods" are free-flowing — in the bin — in the bag — in the fertilizer spreader. You can cut costs in the plant, avoid regrinding of lumpy bagged material. Your farmer friends get a better product.

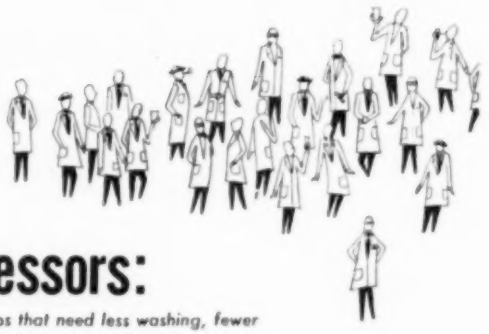
Here's how Nacconol is used:

Use *Nacconol NR Flake* or *Dense Beads* — the free flowing, non-dusting types that disperse beautifully and uniformly. Add the required amount at the weighing hoppers or pre-mix with potash or other dry materials being used in the mixture. Distribute Nacconol throughout mix as thoroughly as possible. It's simple and easy as that! Remember Nacconol is time-tested . . . your best all-around money value. Millions upon millions of pounds of Nacconol have been used over the past twenty years in America's leading industries. Available from nearby warehouse stocks. Write, wire or phone our nearest office.

What TEPP* can do for

farmers:

Spray one day and harvest poison-free crops 48 hours later!



processors:

Cleaner crops that need less washing, fewer rejects due to last-minute infestations!

They all like remarkable TEPP—the pesticide that kills without leaving any lingering poisonous residue. When properly handled, TEPP can assure cleaner, higher quality crops that mean more profits for both farmer and processor.

Low cost, amazingly effective TEPP kills aphids, thrips, red spider mite, leafhopper nymphs, flea beetles and many other pests. TEPP is available 1) as a liquid concentrate, 2) as a stabilized dust, and 3) with other active ingredients. For quick kills and residue-free crops, specify TEPP formulations from your supplier. For the names of manufacturers of TEPP, write to Eastman Chemical Products, Inc., Chemicals Division, Kingsport, Tennessee.

TEPP*

means pest-free crops

poison-free crops

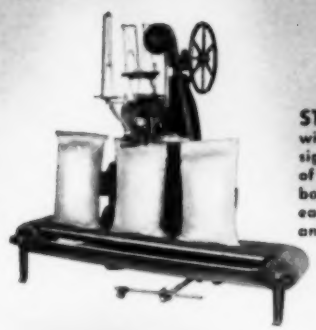
**Tetraethyl Pyrophosphate is made from triethyl phosphate—an Eastman chemical. TEPP is not supplied by Eastman Chemical Products, Inc.*

Eastman
CHEMICAL PRODUCTS, INC.
KINGSPORT, TENNESSEE

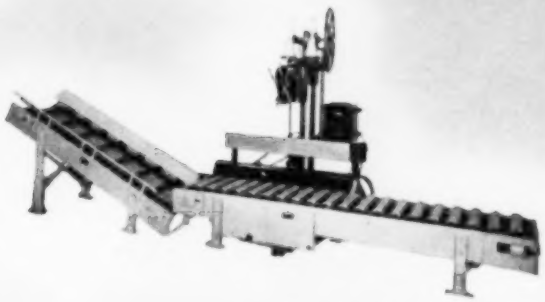
Sales representative for **TENNESSEE EASTMAN COMPANY**, division of **EASTMAN KODAK COMPANY**

BAG CLOSING MACHINES *Engineered*

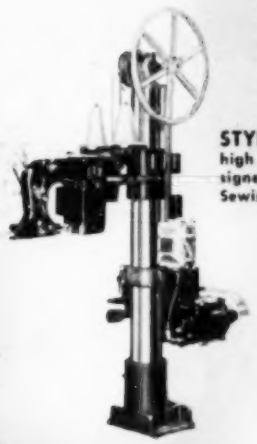
TO MEET MODERN PRODUCTION REQUIREMENTS!



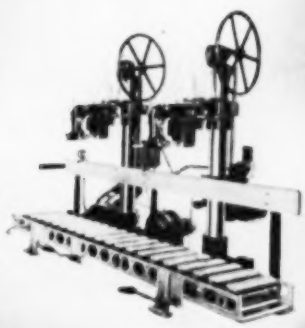
STYLE 21800 H *(Left)*, equipped with 80600 H sewing head, is designed for fast, economical closing of paper bags. Bag is sewed, tape-bound, and tape is cut off neatly at each end of closure. Sewing head and conveyor adjustable vertically.



CLASS 20500 *(above)* machines are heavy duty, high production units for closing medium and heavy weight bags. Available with power-driven horizontal conveyor, inclined conveyor, or both; or with conveyor transmission unit only, for plant production line.



STYLE 20100 H *(left)*, is a heavy duty, high production column type machine designed for use with plant conveyor systems. Sewing head is pedal controlled.



DUPLEX MACHINES *(right)* are designed for closing double bags. The first sewing head closes the inner bag; the second closes either the outer bag alone, or both bags together for extra safety. Also recommended for single closures where continuous operation is a must — operator can instantly switch to other head.

Union Special®

No two jobs are exactly alike — that's why Union Special builds a wide variety of bag closing equipment. In the Union Special line you will find machines for closing all sizes and kinds of bags from small textile or paper bags of one pound, or less, up to the largest jute or multiwall paper bags in use today. And whether your schedule calls for closing just a few bags or for high continuous output, Union Special can supply the equipment to do the work efficiently, economically, dependably! FOR THE BEST IN BAG CLOSING EQUIPMENT, LOOK TO UNION SPECIAL. See your Union Special representative for recommendations, or write.

Ask for Recommendations

UNION SPECIAL MACHINE CO.
447 N. Franklin St., Chicago 10, Ill.

Gentlemen: Without obligating me, please furnish information on bag closing equipment to handle the following production:

Kind of bags used? _____

Filled weight of bag? _____

Material being packed? _____

Maximum bags per minute? _____

Check-weighing required? _____

Conveyor required on Machine? _____

Power: ☐ D.C., ☐ A.C., Volts _____

Phase _____ Cycles _____

Name _____

Company _____

Address _____

MACHINE COMPANY
447 North Franklin St., Chicago 10, Illinois

CONTROL...
vital for pesticides
Laboratory Control — Formulation Control — Processing Control...
Insures Better Insect Control
with our
COMPLETE LINE OF PESTICIDES
ASHCRAFT-WILKINSON CO.
Home Office • Atlanta, Georgia
TOXAPHENE 40% • BHC • ALDRIN • PARATHION • DDT • SULPHURS • CHLORDANE • DIELDRIN
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LINDANE

"TOPS" FOR CROPS!

LINDANE, one of science's newest and most effective insecticides, is deadly to a host of insects that attack the farmer's crops and cattle.

LINDANE protects fruits, vegetables, cotton, livestock, soil, forage and small grains crops, orchards, ornamentals and shade trees. With its ease of formulation and with the assurance of a plentiful, economical supply from our new plant at Baton Rouge, you'll find LINDANE profitable to use in your formulations.

As a guide to processors, we've published a new 30-page booklet, "'Ethyl' LINDANE". This fact-packed brochure gives detailed data on LINDANE's advantages, applications and formulations, its physical and chemical properties, toxicity, methods of shipment, analysis and detailed suggestions for its use.

We'll be glad to send your copy. Just drop us a line on your business stationery.

"Ethyl" Lindane
Yours for the asking!

In addition to LINDANE, Ethyl offers you the effective insecticides Extra High Gamma (30) BHC and BHC (technical), and the brush killers 2, 4, 5-T Acid and Esters.

ETHYL CORPORATION
Chemicals for industry & agriculture

100 PARK AVENUE, NEW YORK 17, N.Y.

ATLANTA, BATON ROUGE, CHICAGO, DALLAS, DAYTON, DENVER, DETROIT, HOUSTON, KANSAS CITY, LOS ANGELES, NEW ORLEANS, PHILADELPHIA, PITTSBURGH, SALT LAKE CITY, SAN FRANCISCO, SEATTLE, TULSA, MEXICO CITY AND (ETHYL ANTIKNOCK, LTD.) TORONTO

ETHYL
LINDANE
ETHYL CORPORATION

MADE AS CAREFULLY AS YOUR BEST TAILORED SUIT

Top-grade bagging materials plus expert designing and careful construction, give V-C Multiwall Bags the ability to stand rough, tough treatment in handling, in shipping and in storage.

Better-built V-C Multiwall Bags are made and attractively printed to your specifications in the following styles: sewn open mouth, sewn valve, sewn valve with sleeve or with tuck-in sleeve, pasted open mouth, and pasted valve.

Write for full information, or discuss your bag requirements with a V-C representative. Get the facts now on V-C's speedy deliveries and expert technical assistance.

V-C MULTIWALL BAGS

2 TO 6 PLY

Plain or printed in 1 to 4 colors

VC BAGS®

Virginia-Carolina Chemical Corporation

BAG DIVISION:

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DISTRICT SALES OFFICES: Atlanta, Ga. • Wilmington, N. C. • New York, N. Y. • E. St. Louis, Ill. • Cincinnati, Ohio

OTHER V-C PRODUCTS: Phosphate Rock Products • Complete Fertilizers • Chemicals • Cleansers • Textile Fibers • Pest Control Products

ACCEPTED AS THE STANDARD For DDD or TDE Insecticides

Because RHOTHANE effectively controls such pests as red banded leaf roller, tobacco hornworm, tomato hornworm corn earworm, and a host of other pests, *without injury to plants*, this Rohm & Haas insecticide is accepted as the standard for DDD or TDE formulations.

Rohm & Haas pioneered in the development, manufacture and application of this type of insecticide. And for five years Rohm & Haas has maintained its leading position in the DDD field.

RHOTHANE is available to formulators as RHOTHANE D-3 technical flakes, as dust (AD-50), wettable powder (WP-50), and emulsifiable concentrate. For complete technical data and suggested formulations, write our Agricultural and Sanitary Chemicals Division.

CHEMICALS FOR AGRICULTURE

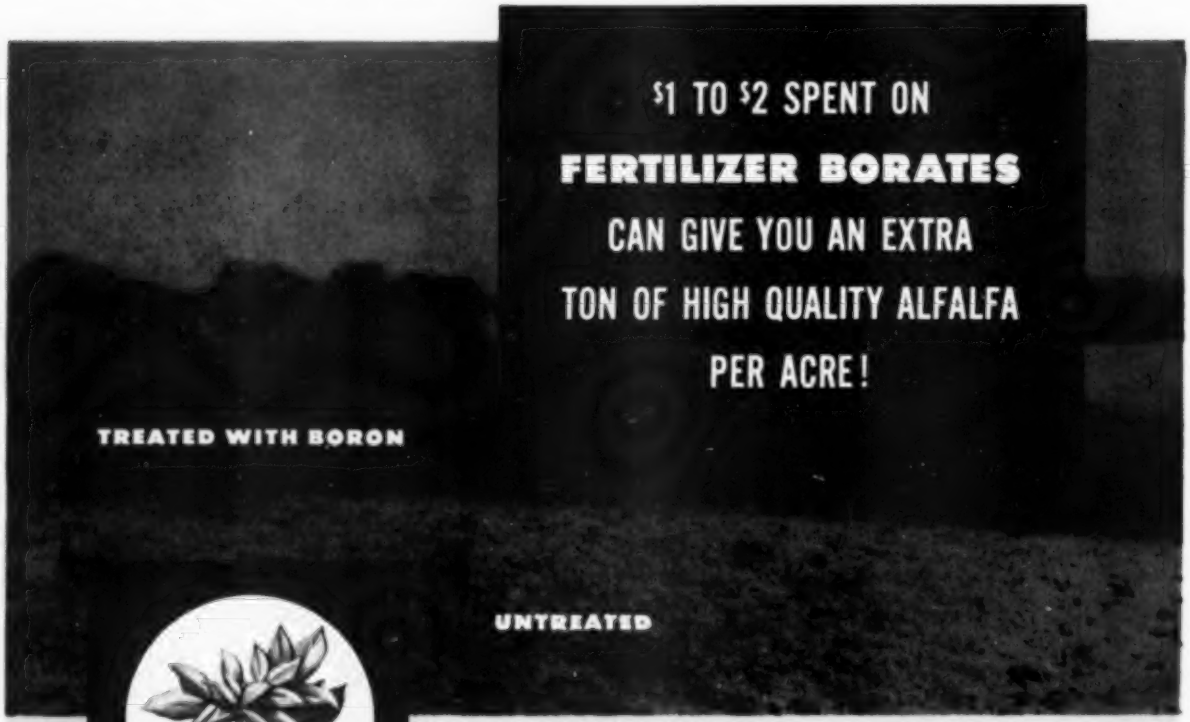
ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

RHOTHANE is a trademark, *Reg. U.S. Pat. Off. and in principal foreign countries.*

Want a Greater Alfalfa Yield per acre?



BORON-HUNGRY ALFALFA...Dwarfed and puny, with yellow or reddened top leaves, stunted, with growing tips rosetted. When these symptoms appear, it's Nature's distress signal for a new supply of Boron.

TOP QUALITY ALFALFA...Fertilized with Boron, grows lush and strong...provides maximum yield with bigger profits. Vigorous growth, such as this, shades out weeds resulting in longer life stands.

Borated Fertilizers pay 3 ways on Alfalfa

1. **EXTRA YIELDS**—an extra ton of hay per acre.
2. **BETTER QUALITY**—hay that is extra-leafy and green.
3. **LONGER LIFE STANDS**—vigorous growth shades out weeds.

Yes, Boron means bigger crops of better quality! Alfalfa responds so readily to Boron that, in some cases, yield per acre is doubled. To put Boron back into the soil, use FERTILIZER BORATE—HIGH GRADE . . . it's the low-cost fertilizer borax, rich in Boron. (Contains approximately 121% borax equivalent).

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Editorial COMMENTS

BEYOND the 1952 fertilizer consumption tonnage figures, impressive as they are, lie some additional significant facts not entirely evident in merely looking over the statistics published in this issue. Although fertilizer consumption increases tonnage-wise year after year, the *real* criterion of use advances even more. Plant food content in higher-analysis fertilizers has been stepped up so that a single gross ton of today's mixed fertilizer has from 10 to 40% more nitrogen, phosphate and potash than its counterpart of yesteryear.

A glance at the tables showing grades of fertilizer is a good tipoff on what's happening. Where many in the industry can remember mixing grades of 2-6-2, they will now note many mixtures containing tremendously concentrated amounts of nutrients, plus certain trace elements.

It is thus possible for the consumption of total mixed fertilizers in the U. S. to be reduced but still to maintain the use of primary plant foods at an even greater rate! These facts provide an answer to the riddle of "When is a ton not a ton" . . . when it contains 60% plant food instead of ten or fifteen percent.

The progress toward universal use of high-analysis fertilizers is slow but constant. Encouraging signs of its continuance are seen in the annual USDA fertilizer consumption report found in this issue. The educational efforts of both industry and governmental agencies toward this end are paying off and the end user, as well as the fertilizer industry itself, is better off for it!

AS if manufacturers of agricultural insecticides didn't have enough to worry about already, they had another hot potato tossed into their laps last month in the form of an adverse decision by the Virginia Supreme Court of Appeals in an important liability case involving injury sustained by an apple grower following application of a mercury fungicide made by one of the leading firms in the industry. Directions on the label for the product warned the user against use of the spray after petal fall. Application by the plaintiff was admittedly made ten days to two weeks after petal fall. Yet the jury awarded him damages of $30,000 and this decision has now been sustained by the higher Virginia court.

Apparently the Virginia courts are in the process of developing some new ideas on liability and negligence. It is no longer sufficient to give directions for proper use, and to warn generally against incorrect use. At least in this case they seem to have held that an obligation exists to put on the label a warning or caution statement to warn against specific dangers of injury which might arise if the material is used contrary to directions. Following the same legal thesis, perhaps knife manufacturers must now warn buyers what will happen if they use them for throat cutting, and automobile manufacturers will have to attach labels to all their cars warning the operators not to drive on sidewalks, or to run down pedestrians. Truly, as one of the dissenting judges observed, this decision "fashions a broad new law of negligence in conflict with that which we have followed for many years."

This is a decision which should and must be

(*Turn to Page* 117)

For Agricultural Use in the South; Recent Advances in

Spray Equipment*

ONE of the outstanding steps taken in the direction of mechanization in the handling of crops has been the recent rapid development and wide-spread acceptance of spray equipment by the cotton growers.

Only a few years ago, no spray equipment of any kind was to be found on the average farm. Some of the livestock, fruit, and vegetable growers had spray equipment, but it was of the high gallonage, high pressure type. With the development of low gallonage spraying for weed and insect control, the picture has changed, until now a high percentage of the cotton farmers own or have access to some kind of a sprayer.

The first low gallonage weed sprayers appeared in 1947. The first cotton insect control tests with sprays were made in 1948 and the first commercial usage was in 1949. Dependence upon sprays has spread so rapidly that within 3 years, 85% of the cotton insecticides sold in Texas was in liquid form for use in sprayers, according to figures released by the state extension department. During this period in Texas, there was a several fold increase in the cotton acreage treated for insect control, and most of the additional insecticides were applied as sprays.

This increase in use was due to several factors. The great benefit from early season insect control was the biggest single factor. Wide-spread educational activities by state, federal and commercial agencies contributed their influence. New chemicals with the ability of doing a better job were important; and last was the spray method of application with its lower equipment and chemical cost. Its greater effectiveness is especially useful in windy weather which is common when early season applications should be made.

In general, it has been found that the low gallonage cotton sprayer can be used successfully for insect control elsewhere, such as on vegetables, grain and forage crops. At one time, many farmers who have only a few cattle would never have considered treating them for insects, but now they add a hand gun to their cotton sprayer and treat their cattle.

Since cotton insecticide sprayers were introduced, there has been no basic change in the general design for this purpose. However, certain improvements have and are being made in details. Most cotton spray manufacturers now offer models that can be used along with cultivator equipment, and most have now standardized on three-gallon-per-hour hollow cone nozzles.

From the start, rotary pumps of one form or another have been used because of their small size and comparatively low cost. At the same time, however, they have been the greatest single weakness of the cotton sprayer. Bronze has been widely used because it does not rust. However, bronze pumps have proven erratic, some giving good service and others of the same make wearing out after short service. Iron gear pumps wear better and will last longer if the user will flush them out with oil after each usage with water. Nylon roller pumps have given good service but are higher in price.

Limitations Noted

THE subject of pumps for low gallonage sprayers is one badly in need of additional research by industry. Several manufacturers have brought out models of tractor power takeoff operated piston and diaphram pumps, but none so far quite fill the bill. The ones made thus far are regarded as being too large and cumbersome, requiring a large compression chamber. They are also priced too high to attract the mass market. They are, however, a beginning and it is the writer's personal opinion that the final answer will be a simple lightweight, low-priced piston or diaphram pump that operates directly from the tractor power take off.

Hose lines have been another weakness of the cotton sprayers. The best grades of synthetic rubber do not last long when taken care of improperly. Most users, unfortunately, will not bother to flush the spray out of the hoses after use. Prolonged contact with the common insecticide mixtures softens the hose and causes it eventually to go to pieces. The usage of

*Delivered to Southwestern Branch, Entomological Society of American, Third Annual Meeting, Galveston, Texas, February 26-27, 1953.

by

Dr. H. A. Waters

Southwest Sprayer & Chemical Company
Waco, Texas

The late Dr. Waters stands beside cotton-spraying device he designed recently. Dr. Waters was the victim of an auto accident in April. This article had been completed only shortly before.

pentachlorphenol in diesel fuel following a season's insecticide usage has been found to be especially hard on rubber hose.

Several of the common plastics are highly resistant to insecticide mixtures. However, a plastic hose reinforced with fabric to stand high pressure, is not available as yet. One manufacturer of hose has indicated that they can and will make such a hose soon. Most plastic garden hoses are too soft to be used as an intake, being apt to flatten out due to the suction of the pump. Plastic garden hose is satisfactory for the overflow hose, but most types of hose of this kind will not stand sufficient pressure. This is especially true when the hose and contents have been heated by standing in the hot sun. One brand of heavy wall, tough plastic industrial hose is available that will withstand the pressure used for most cotton spraying and can be used successfully. The catch is, this type is not available in sizes under one-half inch.

The answer here would be a plastic hose of the several required sizes, made with a fabric embedded in it. Before long, such hose should be available, and then the grower can expect many years service from his sprayer hose, even with the usual poor care.

New Nozzle Designs

ONE nozzle manufacturer has changed the internal design of the hollow cone nozzle to reduce the incidence of plugging. Most hollow cone nozzles have the one outside opening and two slots leading into a swirl chamber back of this opening. This particular manufacturer has designed a swirl chamber that functions quite well with only one slot. By combining the area of these two slots into one, the cross sectional area has been doubled. In addition, the slot area and outside hole area, are now made about the same size.

This gives the largest possible opening. Thus in a three gallon per hour tip of this style, the smallest constriction in the nozzle is .033 inches across. With two slots, the smallest opening was .019 inches across. In the one gallon per hour tip, this change increased the diameter of the smallest constriction from .010 to .018 inch, making the one gallon tip relatively free of clogging trouble. Further changes in the shape of the swirl chamber made this style of nozzle function well at a much lower pressure than before. This point is especially important for hand spraying. For power sprayers, it means less pump wear.

It has been found that for cotton insects, the hollow cone tip is superior to the fan tip. For aphids and mites on grain, both styles have proved satisfactory. Thus, to spray grain for control of these pests, a farmer can take his cotton spray rig, set the nozzles so one points downward about every twenty inches, and do a good application job using approximately 5 gallons of total spray per acre.

A felt intake strainer, to go on the end of the intake hose, to remove fine abrasive silt from the water has been introduced by two manufacturers. Such strainers do a more efficient job of filtering the water, but by the same token, must be cleaned more often when used with dirty water.

Special hand booms are now available for the cotton grower who has only a few acres to spray. A long handled boom offers safety for the operator. For early season one-nozzle-per-row treatment, a man can easily treat an acre an hour. With equipment costing $25 or less, a man can treat four to six or eight acres in one half to one day.

The secret of success of this hand application by the common laborer is to use only one gallon of spray in a 3½ or 4 gallon compression. One good pumping will deliver the entire gallon at an adequate pressure. If two gallons are used, it must be repumped at the proper time. Most common laborers lack

(*Turn to Page* 163)

Use and Marketing of

Agricultural Ammonia

by

T. H. Leavitt

Senior Agricultural Technologist
Shell Chemical Corporation

SINCE the first introduction of agricultural ammonia (NH_3) by Shell Chemical Corp. some 20 years ago, application of this type of fertilization has grown both in scope and in popularity all along the Pacific Slope. Methods of application have been improved constantly over the years, and now NH_3 is applied either by "Nitrogation Service" or "Nitrojection Service", trademarked terms used to indicate whether the ammonia is applied via irrigation water or by way of injection into the soil. The former method was used exclusively at first, but the company began to investigate the possibility of adapting the use of ammonia to non-irrigated lands.

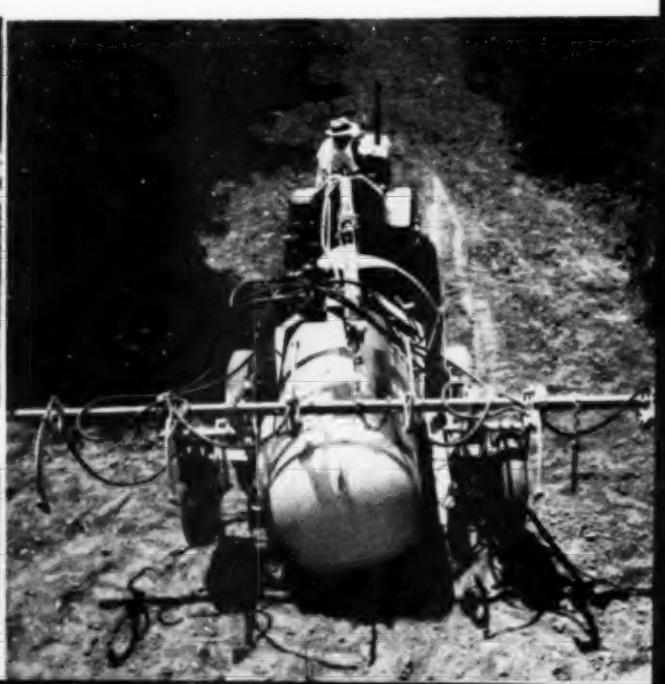
Sales of anhydrous ammonia increased yearly in California, due in part to the fact that the Central Valley of California has a growing season of nearly ten months for a wide range of crops. Now more than 250 different crops are fertilized annually in that state with anhydrous ammonia. California citrus growers are the largest single group of growers using anhydrous ammonia to increase their yields. Another extensive use of NH_3 has been on the irrigated farms of the Imperial Valley along the Mexican border and the Salt River Valley in Arizona where for years farmers have depended upon this fertilizer to grow out-of-season produce.

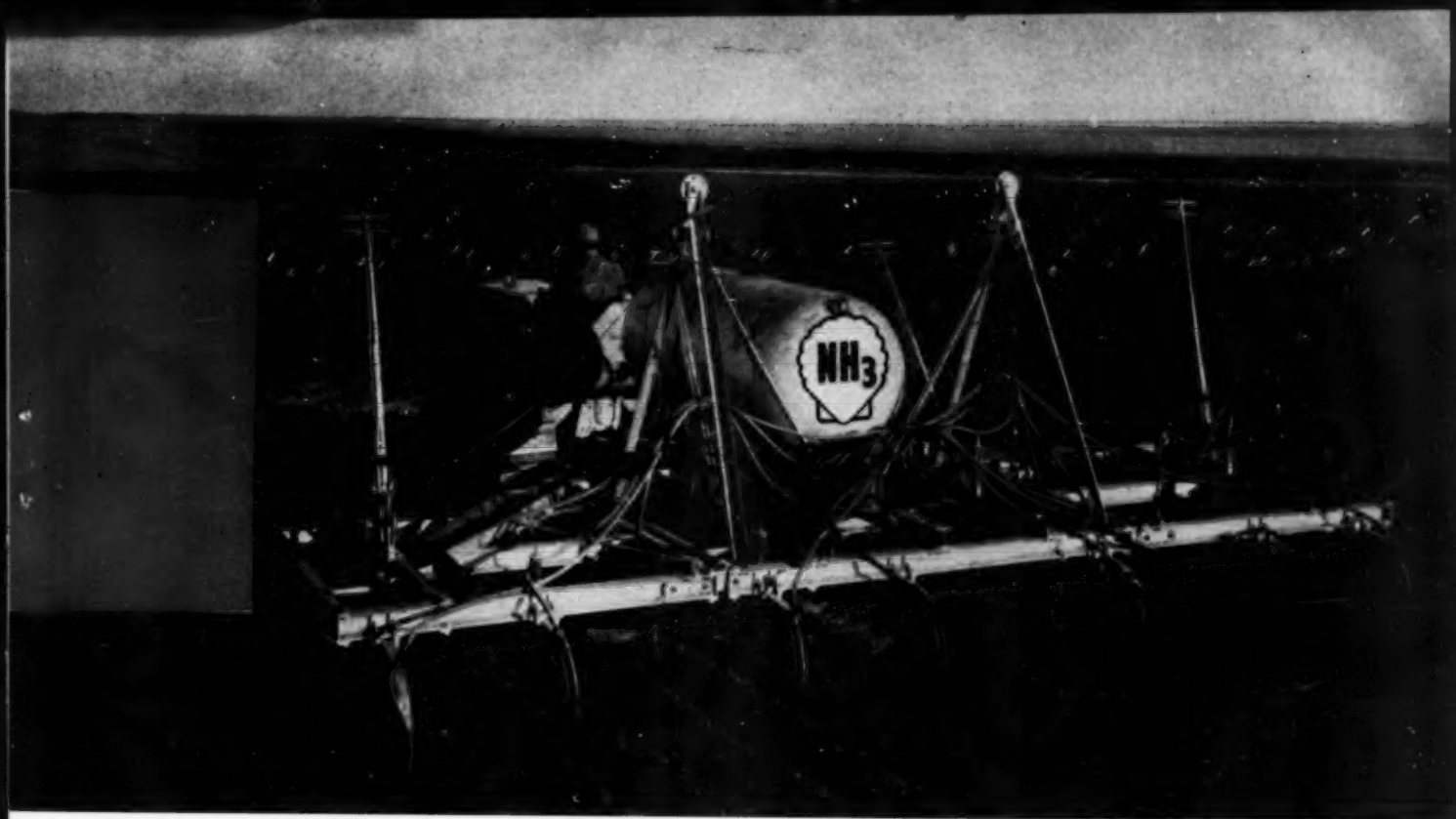
In recent years, expansion of production facilities was required to take care of demands in the Pacific Northwest where wheat growers in the non-irrigated areas of Eastern Oregon and Washington have become large consumers. In this area of varied rainfall, yield results with agricultural ammonia have been described as amazing. A little further north and west in Washington's Yakima Valley, anhydrous ammonia has also gained wide acceptance as a nitrogen fertilizer. With the opening of new farm lands created by the Bureau of Reclamation's Columbia

Photos Below:

(Left): Ammonia is metered out of cylinders into the irrigation system and thus carried evenly to all parts of irrigated land.

(Right): Injector being connected to bulk ammonia tank prior to being used in grove near Lodi, California.





Basin Project, further demands are being made for agricultural ammonia.

A complete network of Shell NH_3 sales outlets can supply every major agricultural area with NH_3. However, the company does not sell on an f.o.b., plant basis. All ammonia sold to the farmer is applied by trained Shell NH_3 distributors from company-owned containers. Special NH_3 application equipment has been designed by company engineers to insure maximum results whether the material is applied in irrigation water or by injection.

When agricultural ammonia is to be applied by Nitrogation Service, the farmer indicates the amount of nitrogen required, time and place. Then NH_3 distributors deliver the ammonia in cylinders to the field, cooperate with the grower in controlling the irrigation water, determine the rate of application and supervise the whole job. When the fertilization job is completed the cylinders are picked up and returned by the distributor and the farmer is billed only for the amount used.

This service has provided farmers with a satisfactory source of nitrogen, inexpensive in respect to unit price, efficient, and requiring little labor. The experience gained since 1932 has provided a wealth of information of the nitrogen requirements of West Coast crops.

Data obtained from analyses of water flowing in irrigation systems to which ammonia has been added, reveal a startling uniformity of nitrogen concentrations. In "Nitrogation Service" the flow of ammonia does not exceed ½ pound of ammonia per California Miner's inch of water (9 gallons per minute), the equivalent of 109 parts of ammonia per million

Pictures this page

Above: Modern ammonia injection apparatus equipped with 7 shanks operating in a Pacific Northwest grain field. Equipment is owned and operated by Shell Chemical Corp. which seeks to improve methods of application by modernizing equipment continually.

Pictures at right: (top) Reformers of Shell plant, Pittsburg, Calif., where anhydrous ammonia is made. (Production soon to be supplemented at second plant at Ventura, Calif.)

Center photo: Tractor-drawn injector for applying smaller quantities of NH_3.

Lower photo: A million gallons of ammonia are contained in this 5-story-high sphere at Kerman, Calif. It will hold enough NH_3 for 65,000 acres of agricultural land. It is said to be the largest sphere for fertilizer storage ever built in the heart of an agricultural region.

gallons of water. This has been set as a maximum rate because up to that point, nitrogen distribution over the field is as uniform as the distribution of irrigation water. Hundreds of tests on the ammonia content of irrigation water have been made, showing an average of less than 5 per cent variation from one end of the field to the other. While 109 parts per million is a maximum figure, commercial applications range between 50-70 parts per million concentration.

Injection Into Soil

THE step from nitrogation to nitrojection was not an easy one. The author first visualized the possibility of direct injection of anhydrous ammonia into the soil upon observing a sub-surface cable layer working along side the highway. Following this inspiration, intensive lab work was undertaken by Shell as early as 1939 to find a practical method for direct injection of ammonia. The first problems to be solved were how much ammonia could be fixed in the soil by ionic base exchange, and how rapidly and to what extremes from the point of injection the ammonia would penetrate.

The apparatus used for these early experiments was simple, consisting of a wooden box 12 inches square and 2 feet long. Holes were bored in the center of both ends of the box and a small diameter rubber hose was threaded through them. The box was then filled with soil, reasonably compacted. As the rubber hose was drawn through the soil in the box, ammonia was released at a rate approximating 100 pounds per acre. After allowing an hour for fixation of ammonia, the soil in the box was cross-sectioned and sampled in one-inch squares. The nitrogen content of each sample was determined by Kjeldahl nitrogen test method and then compared with the original nitrogen content of the same soil. The data obtained from this experiment revealed that the ammonia was fixed by a Yolo sand loam soil and penetrated approximately two inches in each direction from the point of injection. Later experiments proved that texture and base exchange capacity of the soil govern the rate of nitrogen fixation and penetration.

To carry the investigation of the penetration and fixation of ammonia from laboratory scale experiments to a commercial scale operation was the next logical step. First field trials with an experimental injection applicator were made near Hamilton City, California, on April 24, 1940. From this beginning, the injection of ammonia directly into the soil, has become a major contribution to crop fertilization.

Special Equipment Needed

THE first "Nitrojection" ammonia equipment was a trailer-type unit patterned after a Kilifer cultivator. The ammonia was injected into the soil through ¼-inch steel tubes fastened to the backs of standard cultivator chisels. This early model carried a single cylinder containing 150 pounds of ammonia.

A staff of agricultural engineers immediately began designing equipment to improve the experimental models, since at that time no equipment was available from manufacturers to do the required job. All types of injection equipment including shanks, containers, hoses, and miscellaneous fittings, had to be designed. Two of the most important developments in connection with the design of ammonia injection equipment were the metering system and the special injection shank. (Both of which are patented.) The metering system measures ammonia into the soil accurately, regardless of temperature and pressure variations. The injection shank incorporates many features such as optimum pattern, maximum absorption, and low power.

Although patent coverage was obtained for this activity in 1939, World War II restrictions limited the available ammonia so that commercial applications of direct injection of anhydrous ammonia did not begin to gain momentum until 1943. Today, hundreds of injection rigs ranging in size from small rubber-tire tractors to giant crawler types carrying a forty-foot tool bar and capable of injecting 200 acres per day are at work.

Shell's anhydrous ammonia is produced near Pittsburg, California, at the largest synthetic ammonia plant west of the Rockies. Here nitrogen is removed from air by low temperature distillation and then combined with hydrogen, obtained by cracking natural gas. The resulting ammonia gas has a purity of 99.9 per cent. The ammonia gas is compressed to liquid which is stored and delivered in pressure containers. Largest of the delivery containers is a 26-ton capacity tank car. These railway tank cars are used primarily for transporting from the point of manufacture to field unloading points where the ammonia is transferred to small containers designed for field use.

In the early part of 1948, the company undertook the job of developing large bulk containers and aided in the preparation of national safety regulations governing the design and use of anhydrous ammonia containers. Developments included a 6,000-pound capacity trailer tank and a 1,730 pound tank in which the ratio of steel to ammonia was reduced to about half of that in previous tanks, thereby effecting a valuable saving in transportation costs.

Application equipment plays such an important part in good service to the grower that the company furnishes to its distributors much of the equipment needed for application. The portion owned by the distributor is approved by the company.

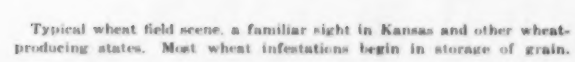
Farming "know-how" also plays an important part in the sale and application of ammonia. The distributors have an intimate knowledge of farming practices in their sales territory. Knowledge of the chemical composition of the soil and the irrigation water used, is important before application is made. Weather, condition of soil and its degree of preparation also play an important part. The history of the crop and fertilizer program on a particular field contributes to the decision of how much, and when NH_3 should be used to get the best results.

The company's Fertilizer De-

(*Turn to Page* 163)

Barbeques; putting idea across to farm advisers; county-wide demonstrations, all used to promote a new treatment for the

Protection of Stored Grain



Typical wheat field scene, a familiar sight in Kansas and other wheat-producing states. Most wheat infestations begin in storage of grain.

WHILE the introduction of any new product is a difficult feat for any experienced sales organization, promotion of a product which involves a change in habits of the end-user, sees the problems multiplied many-fold. This is particularly true when such an innovation seeks to improve methods of long-standing or to alter habits of the persons involved.

The company is faced, in effect, with changing a way of life. That was our problem in the introduction of "Pyrenone Wheat Protectant" and "Pyrenone Grain Protectant." These two products really took the place of nothing which had been used before, and their use meant a different way of doing things to reach the age-old objective of controlling insect infestation in stored grains.

In entering the field of protecting stored grains against insect infestation, not only the opportunity of a good market presented itself, but also that of rendering a valuable service to agriculture. We were aware that, with the clamor for cleaner wheat, fumigation was not the whole answer. Wheat comes into the bin free, or comparatively free, of insect infestation; but on every farm there are many insect breeding places, from which insects can attack wheat throughout the storage season. One specialist has estimated that there are at least 20 different places where insects can breed on the average farm.

Preventive Measures

FARMERS, we knew, do not fumigate their wheat until they have an infestation problem. By this method one can practically eliminate the insects, but the fact that infestation has started, means there are already signs of damage, if not the presence of actual insects, either dead or alive. This could mean contamination, and it would be up to the Food & Drug Administration to determine whether that wheat is fit for human consumption or whether it had to be relegated to use for feed purposes only.

"Pyrenone Wheat Protectant" is designed to protect wheat against infestation. The powdered insecticide, containing piperonyl butoxide and pyrethrins, has an adhesive quality to coat each kernel and thus prevent infestation. But the idea had to be sold to the wheat farmer; the idea that he should spend under three cents a bushel to protect his wheat against insect damage, rather than wait to spend two or three cents or more a bushel for fumigation after the damage had been done. And, as every farmer knows, it may be necessary to fumigate two, three or more times during a storage season to keep the wheat clean.

It was the same with corn, rye, barley, rice, and other small grains, although this problem was

by

John Rodda

Manager of Insecticide Sales, U.S. Industrial Chemicals Company, Division of National Distillers Products Corp.

different. Because of the open-type cribs used for the storage of corn and other small grains, fumigation is neither practical nor possible. Thus a field is being entered where nothing at all had ever been done to reduce insect damage. That is, except for whatever protection nature provides.

One of these "natural methods" was the age-old tradition in the south of storing corn with husks remaining on the ears. "Snapped corn," they call it. The theory is, that the shucks on the corn ear help to protect it against insect invasion. Although this may be a constructive approach for some insects, it is erroneous to depend on such a method. There are certain insects, like the army ear worm, which penetrate husks as well as ears and it leaves holes for other insects, such as the weevil, to enter. Once weevils get into an ear of unhusked corn, that ear can be marked for complete destruction!

Selling by Indirection

HAVING established the need for effective control of stored-grain pests and also possessing an effective means of accomplishing this, the problem now becomes one of convincing the growers and attempting to effect a change in their habitual way of doing things. This, of course, embraced a major piece of merchandising which could be done best by indirection.

Of first importance in this direction was to gain confidence in the product by agricultural and business leaders who in turn advise the farmers. The latter have learned to heed suggestions made by county agents and other experts who have made a life-long study of agricultural problems. How can this job of selling the men at the county agent level be accomplished?

After having introduced the products at a press conference in Chicago, a meeting was arranged with prominent leaders in the wheat industry in Kansas City, coinciding with the arrival of the first shipment of "Pyrenone Wheat Protectant" in the city. Among the guests were Jess Smith, of the Kansas Wheat Improvement Association; Herman Praega of the Kansas Farm Bureau and the Kansas Wheat Quality Council, and Professor Donald A. Wilbur and Dr. Roger Smith of Kansas State College.

Later, some 150 business and farm leaders from all over the state of Kansas were invited to a luncheon meeting in Topeka, in the heart of the Kansas wheat belt, where this new control measure for stored grains was described.

These wheat leaders, long aware of the heavy losses suffered every year by farmers because of insect damage, showed keen interest in the idea. The interest of the business leaders, likewise, was acute, since the economy of the state of Kansas depends upon the wheat crop. As a matter of fact, Governor Frank Carlson—now Senator Carlson—conducted the meeting in Topeka, indi-

Photos This Page

Top: Trucks loaded with wheat lined up before a country elevator in Kansas. Insect infestation can start in the elevator as well as in farm storage later.

Samples of corn which had been under treatment nearly two years are handed to agricultural leaders at Thomasville, Ga., for inspection. Note men in crowd looking over samples. No weevil damage could be found.

Third photo: sound grains of wheat untouched by weevils after having received treatment for protection.

Fourth photo: Corn kernels damaged by weevils. Light penetrating kernels shows at least two weevils at work and indicates the hollowed-out condition of corn. Conditions like this can happen in a single storage season if no protective means are employed.

Lower picture: Wheat kernels suffering weevil damage. These, too, have been hollowed out by the insects, one of which can be seen in center.

cating his personal feeling toward a new means of saving millions of dollars annually for Kansas farmers. .

The wheat farmers were also enthusiastic, but they had a reservation, perfectly honest and proper, summed up this way:

"You have got something here—if it works!"

Because the product had been tested meticulously for at least four years before being offered to the public, there was no question about its efficiency. But it was realized that further work along this line had to be done, so cooperative tests under field conditions were set up with Kansas State College, and schools in other states. Last year, the Entomology Department of Kansas State College published its findings, giving the product an unqualified recommendation.

To date, 27 states have recommended either one product or the other, or both. This includes practically every heavy grain producing state.

Barbeque Helps

THE same formula of first approaching the leaders of agriculture was followed in the corn-producing south. Three years ago, the agricultural leaders of 13 southern states were invited to witness a demonstration of "Pyrenone Grain Protectant" at Greenwood Farms, in Thomasville, Georgia. Some 150 people traveled to that remote town to find out about a new product which showed great potentialities for south-

(*Turn to Page* 161)

Formal portion of meeting at Thomasville, Ga. on the truck, (L to R) are Dr. W. E. Dove, director of entomological research, U.S. Industrial Chemicals, Baltimore, Md. and Ed Komarek, manager of Greenwood Farms.

Second picture: Part of Crowd at Thomasville meeting, with metal storage bins in background. This demonstration attracted 150 persons from thirteen states.

Third photo: One phase of the Greenwood Farms demonstration . . . treating husked corn. As grain is hoisted into bin on conveyor belt, it is dusted with "Pyrenone Grain Protectant".

Lower photo: BARBEQUE! Following the serious talks and demonstrations on protection of stored grain, guests are treated to a regular old-fashioned barbeque.

Fertilizer Consumption in the United States, 1951-52

by

Walter Scholl & H. M. Wallace

Division of Fertilizer and Agricultural Lime
Bureau of Plant Industry, Soils, and Agricultural Engineering
Agricultural Research Administration
U. S. Department of Agriculture
Beltsville, Maryland

Table 1. - Consumption of fertilizers, Year Ended June 30, 1952[1/]

State or region	Mixtures			Materials			All fertilizers 1951-52	Relative Consumption 1950-51 = 100	
	July 1 - Dec. 31, 1951	Jan. 1 - June 30, 1952	Total	July 1 - Dec. 31, 1951	Jan. 1 - June 30, 1952	Total		Fertilizers [2/]	Total N, Avail. P_2O_5, & K_2O
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Percent	Percent
Maine	22,470	170,080	201,550	6,716	9,350	16,075	212,571	109	101
New Hampshire	2,235	10,910	13,145	1,325	4,543	5,878	21,023	79	78
Vermont	11,737	24,992	36,729	2,667	6,805	17,500	54,149	99	99
Massachusetts	9,705	64,653	74,358	2,142	12,499	17,651	92,079	96	95
Rhode Island	1,450	12,001	13,345	400	1,796	2,396	16,716	96	99
Connecticut	5,813	32,257	38,040	2,736	12,782	15,698	57,274	99	100
New England	53,370	340,100	400,300	16,014	58,544	85,150	455,764	100	100
New York	97,083	380,629	486,012	40,239	108,080	148,319	634,917	101	105
New Jersey	47,925	198,108	246,033	7,127	18,844	25,971	266,982	102	104
Pennsylvania	166,911	401,908	567,819	58,584	61,808	97,089	664,816	108	110
Delaware	18,000	18,089	36,089	1,917	4,961	6,878	40,967	120	124
District of Columbia	267	1,984	2,251	204	608	810	3,061	117	120
Maryland	77,281	190,024	267,305	9,490	30,131	39,621	306,926	108	110
West Virginia	15,817	57,309	73,126	1,472	10,871	12,343	85,470	99	101
Middle Atlantic	424,284	1,248,251	1,672,535	99,283	235,284	334,567	2,006,482	100	107
Virginia	178,580	580,187	758,767	29,852	99,810	129,194	888,011	106	109
North Carolina	242,590	1,110,906	1,353,496	52,085	188,911	240,996	1,594,492	109	106
South Carolina	119,501	808,810	928,311	18,118	202,732	220,850	979,161	108	105
Georgia	162,382	690,285	1,052,217	64,470	190,434	247,338	1,301,111	99	103
Florida	284,192	389,170	673,362	49,310	69,167	118,476	1,190,762	107	106
South Atlantic	1,187,275	1,582,110	4,766,994	221,304	843,104	1,156,993	6,103,535	108	106
Ohio	210,221	287,231	398,661	26,210	42,190	68,138	1,063,547	110	113
Indiana	288,761	289,253	578,174	28,679	94,183	122,763	1,383,290	110	119
Illinois	282,113	407,198	690,317	410,208	423,938	834,141	1,634,388	122	141
Michigan	180,527	201,953	374,380	15,317	29,184	44,501	580,501	117	119
Wisconsin	79,923	177,230	257,158	15,108	25,803	41,006	393,782	96	101
East North Central	1,201,555	2,362,365	3,563,690	825,305	625,309	1,450,574	4,551,814	114	110
Minnesota	37,728	130,674	171,208	10,107	20,747	30,854	220,130	111	114
Iowa	64,744	211,118	277,861	10,064	80,118	110,182	420,309	111	117
Missouri	121,100	306,713	427,830	110,730	216,580	326,265	765,081	118	116
North Dakota	5,150	16,310	21,475	2,710	7,480	9,973	31,168	220	228
South Dakota	1,210	4,403	5,613	2,004	3,478	5,482	11,094	130	130
Nebraska	6,138	24,000	30,143	23,780	58,308	82,088	98,470	170	184
Kansas	37,106	47,961	84,996	62,021	90,219	152,104	207,480	112	117
West North Central	273,416	744,954	1,200,410	270,905	480,330	722,235	1,769,597	116	122
Kentucky	77,672	408,280	482,952	19,336	87,951	147,187	630,119	112	121
Tennessee	77,257	365,372	442,167	17,816	102,729	120,535	562,560	110	121
Alabama	152,302	737,373	870,275	206,215	268,123	474,338	1,344,600	108	104
Mississippi	83,284	780,249	870,533	197,520	287,197	484,696	855,228	106	108
East South Central	314,215	2,291,274	2,605,927	440,787	736,547	1,232,729	3,401,116	109	112
Arkansas	16,927	170,171	188,098	60,733	110,280	170,973	359,741	94	94
Louisiana	49,515	180,768	230,283	50,475	99,778	150,253	380,536	108	109
Oklahoma	12,024	34,804	46,828	21,120	58,519	309,639	177,466	118	121
Texas	84,367	220,814	305,181	262,470	160,838	423,308	824,364	103	107
West South Central	161,833	606,557	768,390	394,798	443,580	838,378	1,677,106	101	101
Montana	709	2,970	3,679	8,116	13,788	21,904	25,583	110	111
Idaho	190	11,825	12,015	14,220	47,611	61,831	73,846	104	104
Wyoming	49	822	871	1,920	4,825	6,745	7,616	107	106
Colorado	870	18,917	20,888	7,601	19,547	28,948	47,831	94	95
New Mexico	499	1,398	1,920	6,318	10,162	17,880	19,380	88	91
Arizona	1,967	18,588	20,555	60,288	60,570	97,194	118,307	108	107
Utah	333	2,246	2,579	11,617	18,617	29,194	32,653	107	107
Nevada	145	496	641	3,676	3,397	5,071	5,712	110	107
Mountain	4,713	56,309	63,255	93,649	106,701	257,651	321,906	111	111
Washington	5,231	21,491	26,722	25,218	34,716	44,926	71,648	107	114
Oregon	4,018	15,013	20,230	40,717	23,193	100,313	120,808	89	92
California	94,110	134,230	228,340	448,010	504,123	1,032,748	1,027,401	106	105
Pacific	83,359	170,734	281,173	572,944	930,140	1,577,994	1,819,857	104	104
Continental U. S.	5,301,488	11,617,008	16,918,496	2,935,050	4,450,451	7,385,501	22,082,197	107	111
Hawaii	20,040	25,840	45,880	28,316	31,310	59,146	113,681	91	91
Puerto Rico	121,886	160,228	282,103	25,388	16,286	41,784	243,977	91	88
Alaska	3	116	117	0	660	660	843	109	109
Territories	141,914	186,184	328,098	53,704	48,256	101,960	358,221	92	89
Total U. S. 1951-52	5,443,402	11,803,192	17,246,594	2,988,754	4,498,707	7,487,461	22,440,418	106	110
1950-51[3/]	5,286,654	10,690,928	15,978,582	2,840,966	4,073,058	7,013,024	20,991,606	100	100
1949-50	5,889,580	9,868,596	15,758,176	2,261,160	3,749,084	6,140,734	19,765,910	89	86

1/ Includes: natural phosphate rock, basic slag, secondary and minor element materials, such as, boron, sulfur, manganese sulfate, etc., used as separate materials, also fertilizer distributed by government agencies. Does not include liming materials, but includes gypsum.

2/ Includes materials not guaranteed to contain the primary plant nutrients, N, P_2O_5, or K_2O. Their quantities are shown in Table 6.

3/ Revised, additional information for Nevada shows consumption in 1950-51 amounts here shown.

	79	830	773	1,074	1,802	2,896	3,749	--	--

THIS 13th annual survey shows consumption of fertilizers in the United States, including the Territories (Hawaii, Puerto Rico, Alaska), amounted to 22,432,418 tons during the year ended June 30, 1952. Of this total, mixed fertilizers, 15,086,349 tons, constituted 67.3 percent; materials containing one or more primary plant nutrients (N, P_2O_5, K_2O) 6,561,019 tons (29.2 percent); and secondary and minor element materials 785,050 tons (3.5 percent).

Consumption of all fertilizers was 1,441,024 tons or 6.9 percent greater than the revised total (20,991,394 tons) for 1950-51 (1). Increases in consumption of these classes were for mixed fertilizers 1,107,967 tons (7.9 percent), materials containing primary nutrients 194,276 tons (3.1 percent), and secondary and minor element materials 138,781 tons (21.5 percent) greater than their respective consumption in 1950-51.

Fertilizers consumed in 1951-52 contained a total of 5,205,623 tons of primary plant nutrients consisting of nitrogen 1,424,780 tons, available P_2O_5 2,199,376 tons, and K_2O 1,581,467 tons. These quantities represented a net increase for nitrogen of 187,803 tons (15.2 percent), for available P_2O_5 89,476 tons (4.2 percent), and for K_2O 201,654 tons (14.6 percent) over 1950-51. The total content of

P_2O_5 in all fertilizers consumed was 2,678,070 tons. The weighted average total primary nutrient content in all commercial mixtures consumed in 1951-52 was 24.86 percent as compared with 24.19 percent in 1950-51.

The Survey

PRESENTED herein are eight tabulations and two figures designed to show the quantities, kinds, and grades of fertilizers and their primary plant nutrient content that were consumed in the United States and Territories during the year ended June 30, 1952. Included are certain comparisons with earlier years. These tabulations were prepared from reports, submitted to the Division of Fertilizer and Agricultural Lime, by manufacturers, showing the number of tons of fertilizer shipments for consumption in agriculture throughout the forty-eight States and the Territories. Supplementary information was furnished by the State fertilizer control officials and agronomists. All of this assistance is gratefully acknowledged. The word "ton" indicates the short ton.

State Consumption

TABLE 1, shows the total tonnages of mixtures and all materials (including the secondary and minor element materials) consumed in each State, Hawaii, Puerto Rico and Alaska. Consumption in other Territories was negligible. The changes in consumption of fertilizers and of primary nutrients are in percentage of 1950-51, as the base year. These data are presented together in this table to facilitate direct comparisons.

The changes in the consumption of all fertilizers that contain only primary nutrients are shown, in Figure 1, by States. Increases were generally highest in the North Central States where 6,301,511 tons or 28.1 percent of all fertilizers were consumed. These States accounted for 821,354 tons (57.0 percent) of the national increase of 1,441,024 tons.

In the Southern States, comprising the States of the South Atlantic and South Central regions, consumption amounted to 11,058,695 tons or 49.3 percent of the total and

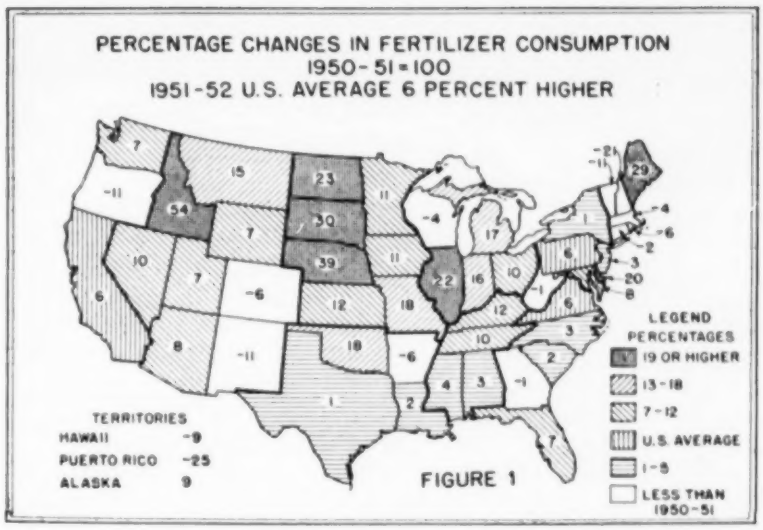


FIGURE 1

Table 1. - Consumption of Principal Mixed Fertilizers in the Continental United States, by Grades, Years Ended June 30, 1952 and 1951

Grade	Consumption		Proportion of Total		Grade	Consumption		Proportion of Total	
	1952	1951	1952	1951		1952	1951	1952	1951
	Tons	Tons	Percent	Percent		Tons	Tons	Percent	Percent
0-8-24	6,510	7,710	.03	.03	8-20-10	19,612	79,811	.13	.52
0-9-27	35,700	49,828	.24	.37	8-20-20	41,745	29,779	.26	.21
0-10-10	4,558	4,852	.03	.03	8-24-8	22,180	27,174	.15	.17
0-10-20	61,740	28,758	.42	.19	8-8-8	8,311	9,247	.04	.07
0-10-30	22,962	18,547	.15	.14	8-8-8	10,076	13,710	.07	.10
0-10-40	3,763	0	.02	.00	8-8-10	3,830	1,011	.03	.01
0-12-12	191,120	344,349	1.29	1.08	8-8-8	2,930	671	.02	<.01
0-12-20	26,157	22,850	.18	.17	8-8-8	70,350	74,237	.48	.49
0-12-28	4,243	5,777	.03	.04	8-8-8	14,732	10,700	.10	.12
0-14-6	3,903	5,408	.03	.04	8-8-9	9,178	29,080	.06	.21
0-14-7	141,794	141,509	.95	1.08	8-8-18	6,365	6,439	.04	.05
0-14-10	45,510	115,929	.29	.85	8-7-7	4,404	4,079	.03	.03
0-14-14	349,421	256,778	2.22	1.72	8-8-8	230,586	260,783	1.56	1.91
0-15-15	16,170	9,670	.11	.07	8-8-8	265,553	263,853	1.78	1.93
0-15-20	3,310	0	.02	.00	8-8-8	299,830	218,574	1.91	1.60
0-16-8	8,241	3,908	.04	.03	8-8-12	43,825	54,744	.30	.40
0-16-8	4,926	0	.03	.00	8-8-9	9,178	29,080	.06	.21
0-20-10	41,240	60,331	.19	.44	8-8-8	15,743	10,263	.09	.08
0-20-20	231,267	217,192	1.54	1.59	8-8-9	9,779	8,988	.07	.07
0-20-15	3,042	2,155	.02	.02	8-10-12	59,145	41,963	.47	.31
0-20-10	6,106	3,302	.04	.02	8-10-4	61,580	53,978	.42	.40
0-10-8	7,210	214	.05	<.01	8-12-4	4,252	3,416	.03	.03
0-12-6	317,896	589,894	2.16	4.31	8-12-6	58,827	43,843	.38	.30
0-12-12	636,717	321,032	4.72	2.35	8-12-12	136,668	80,257	.82	.59
0-12-8	13,801	25,704	.09	.21	8-20-20	3,248	3,704	.02	.03
0-6-8	3,735	5,451	.03	.03	8-24-8	23,098	16,220	.16	.12
0-6-6	13,081	20,044	.09	.12	8-24-12	10,830	12,837	.07	.09
0-6-6	27,371	20,873	.18	.20	8-24-24	3,242	732	.02	.01
0-3-6	900,276	836,177	6.10	6.38	8-30-0	3,101	4,042	.02	.03
0-8-8	407,638	348,478	2.76	2.78	9-7-7	37,376	35,701	.25	.24
0-10-12	45,454	52,721	.29	.34	8-0-8	15,194	17,532	.10	.15
0-10-10	4,171	2,704	.03	.02	8-0-24	21,926	9	.15	<.01
0-8-16	189,389	203,861	1.24	1.59	8-4-4	3,392	249	.02	<.01
0-6-27	79,171	23,229	.54	.17	8-4-8	11,687	1,688	.08	.01
0-10-10	5,680	3,291	.04	.02	8-6-2	2,979	2,863	.02	.02
0-10-12	10,231	7,436	.07	.05	8-6-4	4,822	2,063	.03	.02
0-12-6	862,694	720,914	5.87	5.54	8-6-8	8,182	968	.06	.01
0-12-12	2,191,712	1,991,849	15.41	15.80	8-8-8	80,128	8,753	.57	.06
0-18-9	107,917	119,213	.72	.87	8-8-8	21,315	21,371	.14	.16
0-18-12	3,276	0	.02	.00	8-8-8	286,142	146,868	1.93	1.08
4-4-6	3,290	169	.02	<.01	8-8-10	3,795	3,349	.03	.02
4-4-6	2,462	3,276	.02	.02	8-10-12	11,816	13,060	.08	.10
4-6-7	2,765	2,792	.02	.02	8-12-12	12,571	8,263	.09	.06
4-6-5	7,718	5,716	.05	.04	8-12-16	28,626	20,534	.19	.15
4-6-6	44,306	37,874	.29	.27	8-16-8	6,760	6,522	.05	.04
4-6-8	71,042	85,716	.47	.62	8-16-16	41,075	38,573	.29	.28
4-7-6	114,712	116,355	.81	.87	8-24-8	63,512	37,350	.43	.28
4-8-4	16,459	14,324	.11	.10	8-24-24	33,111	26,990	.22	.20
4-8-6	831,906	806,917	5.59	6.13	9-7-7	8,218	7,814	.06	.06
4-8-8	263,373	286,454	1.79	2.18	9-8-9	4,919	412	.03	<.01
4-8-12	32,521	7,217	.27	.06	10-8-12	30,183	30,704	.24	.27
4-8-12	91,650	83,380	.62	.61	10-8-12	2,263	2,263	.02	.02
4-8-3	81,990	83,010	.56	.61	10-8-20	2,497	3	.02	<.01
4-8-8	622,704	618,461	4.23	4.53	10-8-10	4,636	2,366	.05	.02
4-10-7	608,204	665,510	3.43	5.41	10-8-8	30,785	28,249	.21	.21
4-10-8	3,177	7,990	.05	.08	10-8-8	7,481	2,423	.06	.02
4-12-12	7,664	8,309	.06	.06	10-12-8	18,908	24,386	.13	.18
4-12-8	347,585	286,181	1.67	2.37	10-12-8	58,721	62,691	.40	.51
4-12-8	8,736	12,309	.06	.09	10-12-12	139,382	71,896	.94	.63
4-12-8	215,722	263,398	1.49	1.78	10-12-12	3,851	3,899	.02	.03
4-12-12	82,662	33,067	.56	.24	10-12-16	6,913	8,014	.05	.05
4-12-16	3,589	2,709	.02	.02	10-15-8	10,900	12,861	.07	.09
4-16-0	42,907	51,196	.29	.39	10-20-0	66,476	60,377	.57	.44
4-16-8	62,340	46,926	.42	.34	10-20-10	12,798	11,909	.09	.09
4-16-16	235,224	221,899	1.45	.83	10-30-10	11,866	9,171	.08	.07
4-24-12	86,296	85,782	.58	.48	12-8-10	9,076	14,524	.06	.11
5-5-5	3,253	3,011	.02	.02	12-8-12	6,741	3,869	.05	.03
5-6-6	10,385	9,794	.07	.06	12-6-6	2,709	10	.02	<.01
5-6-6	2,583	892	.02	.01	12-12-12	32,376	15,927	.22	.11
5-6-6	7,490	2,320	.05	.02	12-24-6	8,265	8,552	.06	.06
5-8-12	8,181	8,849	.05	.06	12-24-12	24,832	11,826	.17	.09
5-7-8	18,977	20,186	.13	.15	14-0-14	23,501	15,400	.17	.11
5-7-6	3,941	8,792	.03	.06	14-6-0	8,078	8,512	.06	.06
5-7-10	7,800	6,180	.05	.05	15-8-8	11,789	13,706	.08	.09
5-8-5	8,064	512	.05	<.01	15-15-0	7,126	0	.05	.00
5-8-7	23,291	26,531	.16	.19	16-0-0	6,415	5,767	.03	.03
5-8-8	3,941	161	.03	<.01	16-6-2	1,618	787	.02	.01
5-10-8	908,353	897,573	6.15	6.86	17-7-0	27,497	31,700	.19	.23
5-10-10	663,820	589,539	4.81	4.22	100 mixtures	14,459,219	13,150,282	97.71	95.20
5-12-12	10,338	9,862	.07	.07	Other specified grades[2]	250,361	323,845	1.69	2.37
5-12-16	10,539	8,524	.07	.06	Grade not shown[2]	88,314	88,716	0.60	0.64
5-12-20	3,468	1,536	.02	.01					
5-15-10	9,462	9,456	.06	.06	Total[3]	14,808,304	13,840,991	100.00	100.00
5-15-15	11,480	9,180	.08	.06					
5-20-20	3,267	8,519	.02	.05					
6-30-0	5,904	3,463	.03	.03					

[1] There were 984 in 1951-52 and 833 in 1950-51.
[2] There were, at least, 200 to 300 grades not shown by their guaranteed analysis.
[3] Does not include 277,845 tons consumed in the Territories.

accounted for 384,097 tons (26.6 percent) of the increase.

The Western States, consuming 2,161,751 tons or 9.6 percent of all fertilizers, accounted for 218,882 tons (15.2 percent) and the Northeastern States, comprising the States of New England and the Middle Atlantic regions, consuming 2,530,240 tons or 11.3 percent accounted for 117,290 tons (8.1 percent) of the increase.

Consumption in the Territories amounted to 380,221 tons or 1.7 percent of all fertilizers consumed and was 100,599 tons less than 1950-51.

Consumption of mixed fertilizers increased in 38 States and decreased in 10. The use of materials increased in 25 States and decreased in 23. The greater use of mixed fertilizers accounted for most of the national increase in consumption of fertilizers. Consumption of most of the more important individual materials increased over that for 1950-51, but that of superphosphate decreased, resulting in only a slight net increase in the total consumption of all materials.

Table 1. - Consumption of Mixed Fertilizers, By Grades, in Each State and Region, Year Ended June 30, 1952

State	Fifteen Principal Grades Consumed in Regions Tons															All Other Grades		Total Tons
																Number 1/	Tons	
New England																		
	3-12-12	4-8-12	0-16-16	8-16-16	4-8-7	4-3-8	0-10-20	6-18-18	4-12-12	7-7-7	3-12-8	4-8-8	0-20-20	5-7-10	10-15-15			
Maine	27,708	49,100	16,470	27,844	4,327	0	995	5,473	3,984	500	438	9,776	215	7,245	4,913	41	10,811	202,468
New Hampshire	5,817	0	2,077	528	1,416	0	1,860	1,336	274	783	300	0	1,084	0	0	29	2,358	20,148
Vermont	7,185	0	11,821	469	456	0	4,990	5,777	315	782	584	0	4,252	0	0	32	4,285	39,648
Massachusetts	16,805	0	2,954	0	9,108	6,809	9,499	2,036	0	5,971	8,728	0	435	0	0	14	16,015	78,260
Rhode Island	6,039	0	972	0	882	0	393	174	529	1,016	953	0	132	0	0	27	3,510	14,546
Connecticut	5,797	0	847	87	5,679	14,944	5,238	1,119	3,096	2,829	2,880	0	2,299	0	0	34	13,962	58,648
Total	69,353	49,100	35,148	29,028	22,708	21,753	23,960	16,906	12,708	11,859	10,783	9,776	8,579	7,245	4,913	77	50,923	402,398
Middle Atlantic																		
	3-10-10	3-12-6	4-10-6	6-6-12	4-12-6	6-12-6	0-20-20	10-10-10	0-14-14	0-14-7	7-7-7	3-9-12	4-12-12	3-12-12	6-10-16			
New York	134,941	31,098	163,554	19,737	3,322	62,307	17,348	38,229	5,206	215	10,055	1,974	34	6	7,457	67	33,194	498,619
New Jersey	129,083	9,742	83,568	653	17,044	287	3,702	3,624	5,061	169	9,665	12,908	56	0	1,154	48	16,783	293,021
Pennsylvania	148,686	218,316	37,494	15,084	13,949	3,783	13,394	30,589	12,688	9,316	3,859	304	22,868	6,896	6,084	74	50,899	567,816
Delaware	29,680	10,340	6,018	4,919	8,794	0	1,002	1,982	2,923	353	113	2,106	128	4,815	1,078	31	8,261	74,109
District of Columbia	16	158	865	196	13	0	81	5	19	10	9	0	0	31	0	12	382	1,731
Maryland	60,785	99,049	23,731	23,630	11,069	0	1,926	2,836	6,319	2,616	2,177	6,803	193	20,737	466	65	21,744	287,805
West Virginia	10,593	16,635	3,879	0	6,329	0	6,633	829	6,264	11,309	0	0	38	769	73	23	9,725	73,155
Total	513,784	384,938	317,089	64,162	60,720	66,377	44,089	80,212	38,480	24,688	26,877	24,095	23,450	33,253	16,312	320	100,999	1,711,719
South Atlantic																		
	3-9-6	4-10-6	6-6-6	3-9-9	2-12-12	1-12-6	4-8-8	5-10-5	6-9-6	0-16-16	5-10-10	4-7-6	4-9-9	3-12-12	6-8-8			
Virginia	80,029	23,569	1	6,461	170,805	190,152	10	66,297	18,120	69,441	31,091	0	4,632	4	0	33	116,366	729,727
North Carolina	466,693	380,830	0	100,358	109,613	84,689	1,742	68,045	69,031	64,851	70,728	0	51,720	0	0	12	115,461	1,971,196
South Carolina	69,863	128,904	0	201,698	0	10,725	29,217	61,346	6,511	21,973	4,555	0	0	69,772	0	11	38,256	718,303
Georgia	38,322	2,173	685,949	91,197	48,014	1,697	109,212	7,835	44,638	1,961	9,852	7	4,838	10,270	45	108	209,080	1,263,207
Florida	80	771	80,549	3,863	2,106	16	70,304	5,969	11,515	1,040	3,211	119,308	20,780	1,832	71,010	719	411,187	973,385
Total	655,026	535,906	851,296	404,107	374,178	349,096	220,485	179,502	155,697	159,066	127,082	119,315	81,960	80,879	71,055	799	1,079,509	6,055,994
East North Central																		
	3-12-12	8-12-8	6-18-18	0-20-20	3-9-18	5-10-10	3-18-9	8-8-8	10-10-10	0-12-12	6-12-8	3-9-27	0-20-20	0-9-27	0-20-10			
Ohio	608,220	98,007	8,022	18,298	8,302	91,074	29,971	14,600	8,333	24,381	27,587	98	5,733	850	648	48	51,013	983,641
Indiana	600,494	89,080	69,035	27,648	34,098	15,801	15,206	32,634	16,386	19,033	9,791	19,047	6,847	6,829	686	59	44,022	934,174
Illinois	302,038	9,240	44,501	14,888	41,531	672	5,913	36,947	27,100	8,861	16,987	33,060	806	4,404	5,789	37	44,162	595,907
Michigan	175,496	47,384	51,019	11,896	14,908	5,811	48,828	8,190	4,687	14,801	10,702	894	7	6,125	2,002	27	31,748	638,540
Wisconsin	190,994	20	24,261	44,299	22,477	0	6,941	1,470	16,578	3,018	5,475	5,915	15,861	5,714	15,850	26	32,293	386,886
Total	1,877,792	183,730	196,838	128,129	121,407	113,760	106,859	93,121	69,084	67,110	60,622	59,116	28,944	23,722	25,975	127	253,244	3,537,748
West North Central																		
	3-12-12	8-12-4	6-24-12	10-20-0	8-24-8	6-8-8	6-18-18	4-16-8	6-18-8	0-20-20	8-32-8	8-12-8	4-12-8	6-24-8	3-9-18			
Minnesota	17,870	0	80,756	1,648	208	11	29,883	66	2,987	18,374	5,074	0	18	2,448	375	67	44,824	171,202
Iowa	68,277	2,195	633	16,639	611	2,096	18,240	23,392	52,715	2,808	7,804	4,067	25,899	19,068	3,130	93	44,302	277,948
Missouri	73,828	21,854	38,085	4,462	42,742	17,822	2,844	779	0	36,800	282	23,979	2,705	0	14,033	17	21,297	627,830
North Dakota	1,076	0	6,905	634	0	0	840	156	276	216	5,884	20	0	1,080	0	21	4,761	21,478
South Dakota	346	156	53	1,990	1	0	336	1,188	96	32	247	0	164	416	0	24	933	5,633
Nebraska	36	366	13	8,743	359	18	0	868	121	180	4,764	0	41	133	0	21	18,252	33,690
Kansas	1,813	10,631	986	19,897	11,311	1,180	8	2,079	79	870	10,806	3,847	0	792	108	19	11,973	64,581
Total	163,250	105,356	76,857	63,018	61,018	61,704	80,151	38,144	37,251	59,303	52,857	31,993	28,824	23,948	17,615	134	186,169	1,400,612
East South Central																		
	4-12-7	4-8-4	4-8-8	3-10-6	3-8-6	0-16-16	4-8-8	6-12-12	7-12-6	0-12-12	3-12-12	4-12-8	4-10-10	4-8-8	4-12-4			
Kentucky	0	15	3,158	1,163	21,830	6,502	20,470	4,877	73,147	37,700	46,308	66,086	20,724	173	5,811	47	21,232	482,982
Tennessee	183	7,798	9,801	6,923	114,511	686	6,590	67,613	11,439	36,782	11,178	8,978	19,144	41,233	29,583	47	18,406	463,127
Alabama	408,981	211,996	62,838	2,830	29	99,581	54	114	0	38	5	1	15	89	0	80	37,044	872,275
Mississippi	5	3,842	144,933	177,818	0	7,881	2,272	10	0	0	161	0	3,197	6	196	28	18,366	370,933
Total	409,169	223,651	220,781	188,734	136,370	114,650	29,386	72,614	84,586	74,520	57,652	75,065	43,080	41,501	35,590	202	215,028	2,187,317
West South Central																		
	3-12-2	4-12-4	6-6-6	0-14-7	3-12-12	6-8-12	5-8-15	12-12-12	12-12-12	0-12-6	6-8-6	3-12-12	5-8-27	0-12-12	6-12-6			
Arkansas	68,981	9,611	8,078	1,821	4,712	31,299	13,063	6,573	1,704	1,738	88	1,795	10,615	1,180	62	37	11,080	188,060
Louisiana	61,704	20,963	38,029	2,127	20,831	1,787	283	9,781	2,112	3,168	15,932	2,097	0	1,743	400	28	14,307	200,083
Oklahoma	50,330	12,960	1,767	330	971	17	1,051	330	1,764	1,277	0	5,810	0	337	1,004	27	9,534	85,010
Texas	116,872	27,210	24,673	10,832	2,100	315	3	5,294	11,496	2,230	164	3,160	0	2,504	5,944	55	23,700	235,661
Total	298,016	70,690	66,522	15,108	28,614	33,418	14,400	21,980	17,076	8,413	16,184	12,862	10,615	5,764	7,410	147	58,621	708,814
Mountain																		
	10-20-0	10-10-0	10-16-0	12-24-0	16-8-0	10-20-13	10-10-0	6-30-0	10-20-0	0-14-8	13-13-0	14-14-7	7-21-7	6-10-4	12-10-0			
Montana	2,017	0	30	0	0	0	120	332	0	0	0	0	0	341	0	14	373	3,479
Idaho	1,366	4,389	748	0	0	0	318	619	1,270	0	1,546	0	0	26	1,212	25	732	11,617
Wyoming	189	21	10	20	0	0	135	57	45	0	0	4	8	110	0	9	65	671
Colorado	1,211	208	3,945	3,335	0	1,067	1,990	834	331	1,188	0	0	1,366	0	10	39	4,482	20,993
New Mexico	859	222	0	0	0	0	0	0	1	0	0	0	0	38	0	14	430	1,550
Arizona	6,600	7,600	0	0	2,500	985	0	0	350	0	0	1,469	0	0	0	35	3,171	24,343
Utah	504	132	37	0	0	0	192	639	325	0	33	4	25	837	6	19	355	2,679
Nevada	86	0	1	0	0	0	0	0	29	0	0	0	0	302	0	12	215	991
Total	12,852	12,810	4,821	3,355	2,500	2,372	2,765	2,481	2,349	1,188	1,579	1,477	1,399	1,347	1,228	95	11,993	66,233
Pacific																		
	10-10-5	17-7-0	6-6-6	5-10-4	6-10-10	10-6-6	5-10-10	6-8-6	10-16-0	4-10-10	10-10-10	10-12-10	6-20-10	10-10-0	10-20-20			
Washington	1,368	806	0	3,274	0	0	2,111	0	140	0	380	0	1,330	4	1,300	52	9,686	28,722
Oregon	160	0	0	1,338	0	87	2,215	0	1,078	0	140	0	1,741	313	197	80	8,049	20,298
California	31,984	26,110	19,723	10,143	11,386	10,741	0	9,405	0	6,934	3,975	7,424	0	2,126	0	300	61,110	224,353
Total	33,512	26,916	19,723	14,755	11,386	10,828	10,326	9,405	1,218	6,934	4,495	7,424	3,071	2,473	1,502	332	78,845	473,373
Territories 2/																		
	12-6-10	15-3-12	12-6-10	10-6-7	6-6-10	14-6-5	14-6-10	9-10-6	10-10-6	12-6-6	12-6-12	10-6-5	6-16-16	12-5-16	6-10-8			
Puerto Rico	28,780	28,230	27,210	24,782	21,930	9,803	9,711	7,603	7,238	9,180	9,501	6,332	2,796	2,248	2,305	19	9,741	222,155
	10-16-0	10-20-20	8-16-8	10-20-10	8-10-6	10-6-4	10-10-6	8-20-10	7-8-13	---	---	---	---	---	---			
Alaska	26	22	20	20	18	7	6	5	0	---	---	---	---	---	---	0	0	117

1/ The number of mixtures shown for each State and Region is exclusive of mixtures not specified by grade, although their tonnages are included in the totals.

2/ The total consumption in Hawaii was 56,554 tons of mixed goods which were manufactured to consumer's specifications.

Mixtures

TABLE 2, lists the 164 grades consumed in the Continental U. S. in 1951-52, in amounts of 2,500 tons or more and their consumption in 1950-51. These grades accounted for 14,469,229 tons (95.91 percent) of the total consumption, 15,086,349 tons, of mixtures in 1951-52. Nine of them accounted for 50 percent. Other grades, numbering 984, totaling 250,961 tons, and approximately 200 to 300 special grades, not listed by their guaranteed analysis and totaling 88,314 tons, were also consumed. In addition, 277,845 tons, not included in Table 2, were consumed in the Territories.

Grades consumed in the Territories are not included in Table 2, for the reason that those consumed in Hawaii were reported as fractional numbers of the minimum percentages of nutrients and the principal grades consumed in Puerto Rico were not of the kinds generally used in the Continental U. S.

Table 6. - Principal fertilizer materials consumed in form, Year Ended June 30, 1952[1]

Tons

State & Region	Nitrogen materials					Natural organic		Phosphates				Potash materials		Total primary fertilizer materials	Secondary and minor element materials[2]
	Ammonium nitrate	Ammonium sulfate	Calcium cyanamid	Sodium nitrate	Other[3]	Dried tankage	Other[3]	Phosphate rock[4]	Superphosphate 18-20 Percent grades	Superphosphate Double Percent grades	Other[3]	Chlorides 50 & 60 Percent grades	Other[3]		
Maine	1,814	142	106	189	95	623	174	10	2,071	0	100	28	0	11,096	71
New Hampshire	168	0	0	107	0	140	0	0	0	0	0	0	10	4,745	91
Vermont	328	0	0	198	98	72	40	180	14,261	0	90	565	28	17,865	70
Massachusetts	702	271	101	1,096	219	2,340	4,801	208	8,997	0	720	615	0	17,748	88
Rhode Island	74	188	16	160	50	211	0	0	902	0	0	102	0	2,585	13
Connecticut	941	170	79	990	132	1,071	14,409	119	6,900	0	1,230	1,112	982	27,784	882
New England	3,931	781	331	2,730	613	4,477	20,650	554	42,201	0	2,351	2,870	994	86,184	2,179
New York	4,697	828	894	4,709	1,148	4,047	6,606	586	150,108	99	1,018	830	96	187,713	888
New Jersey	1,888	201	1,810	1,280	155	1,140	2,964	271	7,981	0	838	1,384	80	23,856	117
Pennsylvania	2,979	2,076	982	2,286	600	7,494	4,782	2,186	71,277	62	1,986	1,034	331	99,967	972
Delaware	1,583	91	72	940	201	2,061	39	190	1,989	0	91	112	0	9,171	107
District of Columbia	0	0	0	57	0	838	222	0	99	0	0	0	0	820	0
Maryland	1,628	127	619	2,190	1,188	621	587	6,058	16,760	3	913	206	660	39,333	288
West Virginia	318	247	0	1,910	210	221	301	99	23,237	638	87	15	0	28,758	8
Middle Atlantic	17,181	3,218	4,166	15,836	3,906	16,239	15,597	9,790	230,888	799	4,933	3,838	1,151	390,651	2,674
Virginia	4,968	692	1,024	36,321	17,798	371	221	371	36,768	2,251	5,051	1,318	15,196	130,560	6,816
North Carolina	20,874	972	10,138	158,980	19,788	947	1,788	1,339	33,647	1,987	10,629	10,027	13,870	282,205	27,716
South Carolina	10,931	2,406	2,081	91,250	58,427	280	830	1,356	63,988	83	15,289	10,208	9,481	288,288	2,982
Georgia	18,981	2,919	1,918	98,166	53,702	1,963	604	998	53,732	81	16,890	13,964	1,974	290,760	16,114
Florida	5,077	1,089	737	13,255	13,901	880	5,798	18,760	12,729	98	6,281	4,798	10,885	95,886	204,903
South Atlantic	70,139	9,584	15,898	398,453	202,903	5,288	9,240	22,824	180,864	4,500	59,987	48,834	57,886	1,086,874	58,738
Ohio	9,838	9,638	956	2,298	4,653	1,330	9,078	8,857	17,081	3,776	738	736	720	80,780	96
Indiana	40,824	10,101	1,118	1,406	18,046	823	1,881	44,044	38,048	3,886	852	3,038	388	169,024	47
Illinois	20,207	17,619	896	798	10,911	1,096	8,972	268,074	60,015	1,882	6,034	21,132	1,766	362,084	47
Michigan	10,033	3,697	360	1,162	1,252	296	2,852	2,810	20,304	38	1,018	848	0	43,993	613
Wisconsin	9,640	580	61	33	110	149	3,071	10,280	2,854	77	4,461	2,854	206	46,895	830
East North Central	90,138	43,816	3,700	5,799	34,912	3,191	27,949	334,181	138,907	10,879	13,106	32,111	3,080	1,102,776	902
Minnesota	10,984	288	0	1	180	870	2,284	7,850	10,881	16,974	6,138	228	0	56,988	1,882
Iowa	32,011	6,929	130	0	2,208	67	1,507	25,780	10,904	15,315	2,960	67	104,078	4
Missouri	17,686	2,676	26	168	17,856	1,849	2,208	227,872	18,830	6,966	2,689	11,216	696	320,289	19
North Dakota	860	18	0	0	0	0	0	0	6,930	1,962	0	0	0	9,670	0
South Dakota	1,017	191	0	0	100	28	84	456	2,918	772	880	0	0	6,001	0
Nebraska	10,081	7,960	180	0	7,885	168	878	2,077	4,880	10,881	1,157	4	0	66,196	0
Kansas	26,486	13,870	0	20	2,098	78	38	20,906	24,978	22,952	22,284	280	0	127,108	0
West North Central	119,088	31,935	336	971	34,308	2,881	6,998	284,927	108,908	75,799	36,284	12,975	797	727,761	1,961
Kentucky	30,494	2,881	2,252	2,231	1,769	30	370	23,780	68,048	10,515	2,661	2,062	2,686	147,199	19
Tennessee	40,099	726	1,120	10,158	2,881	897	882	2,870	31,288	9,177	20,986	10,982	2,820	166,527	188
Alabama	61,923	2,310	330	29,781	18,980	660	180	2,730	69,186	2,861	28,886	16,032	2,828	471,908	688
Mississippi	117,611	17,780	6,344	61,236	29,172	18	0	1,888	30,888	3,388	100,261	33,186	0	456,184	1
East South Central	250,127	38,211	9,046	103,406	52,802	994	1,101	30,970	200,980	26,970	241,660	62,810	10,280	1,241,819	708
Arkansas	41,688	9,889	1,470	30,806	10,981	33	33	2,280	66,988	8,888	3,033	20,918	1,886	176,872	1
Louisiana	20,870	2,960	680	11,888	20,984	158	220	6,258	22,878	1,833	26,881	8,872	6	150,287	6
Oklahoma	8,288	2,868	0	367	96	188	883	12,888	20,881	6,188	6,881	3,818	772	107,837	0
Texas	28,888	28,888	1,888	2,888	20,808	2,818	1,133	30,781	127,888	18,888	87,888	1,838	88	513,881	1,722
West South Central	98,841	83,884	3,788	87,887	87,888	3,888	2,788	78,888	238,888	38,888	88,877	88,888	1,188	787,887	1,888
Montana	3,180	2,871	0	0	88	0	188	0	88	11,787	881	8	0	18,888	888
Idaho	8,218	15,888	88	0	88	0	0	888	18,871	18,181	8,188	87	0	87,878	8,888
Wyoming	881	888	0	0	88	0	0	81	2,888	2,777	0	0	0	8,888	78
Colorado	3,818	8,188	0	0	8,228	0	888	0	8,188	8,888	1,781	188	0	28,888	888
New Mexico	1,878	887	0	88	888	88	0	88	2,287	8,881	8,881	0	0	17,888	0
Arizona	11,888	17,888	881	1,718	28,888	2,888	188	0	8,888	2,888	17,878	18	888	88,887	1,287
Utah	8,788	18,188	0	0	88	87	188	88	8,888	8,888	1,881	888	0	27,888	188
Nevada	88	88	0	0	0	0	0	0	888	888	878	0	0	1,888	8,788
Mountain	49,788	88,887	881	1,781	87,881	2,888	1,888	888	88,888	88,888	88,888	888	888	281,788	18,788
Washington	10,788	38,888	188	888	18,888	8,888	8,877	1,888	18,788	8,888	8,187	1,888	88	81,888	2,887
Oregon	17,888	88,781	888	88	8,188	0	888	1,188	18,888	2,888	14,888	1,281	188	88,877	18,888
California	77,888	188,888	8,888	888	188,128	188,888	88,188	8,878	78,188	18,878	78,888	8,888	8,781	787,788	888,888
Pacific	108,818	288,788	8,888	1,888	188,187	181,288	88,718	8,888	88,887	88,888	88,888	8,888	8,878	888,188	888,888
Continental U. S.	788,888	888,888	88,188	888,881	888,888	188,788	188,888	1,188,788	1,888,788	888,888	788,188	238,787	88,781	8,888,787	788,888
Hawaii	0	88,881	0	188	8,887	8	88	1,878	1,888	788	8,888	7,788	1,788	88,888	888
Puerto Rico	0	88,888	88	18	1,878	0	0	0	188	18	88	88	88	81,788	0
Alaska	181	88	0	0	0	0	0	0	0	188	88	88	0	888	0
Territories	181	78,188	88	188	7,817	8	88	1,878	1,877	888	8,878	7,888	1,787	188,878	888
Total: 1951-52	788,188	888,887	88,288	888,781	872,888	188,788	188,888	1,188,888	1,888,188	888,888	788,787	888,878	88,888	8,888,888	788,888
1950-51[5]	888,878	888,888	88,888	888,887	888,811	188,888	188,888	1,888,888	1,888,877	888,788	877,788	888,888	81,888	8,788,788	888,888
1949-50	888,888	888,888	81,878	887,888	888,878	188,888	127,888	788,888	1,888,788	888,888	888,888	888,888	88,888	8,888,888	888,887

[1] Includes materials distributed by Government agencies. Excludes ilme and materials used by manufacturers in the formulation of commercial mixtures.
[2] The principal commodities are shown in Table 8, by regions.
[3] Includes colloidal phosphate, the quantity of which is shown separately, by regions, in Table 8.
[4] Estimated.
[5] Revised. 1949-50 data for Nevada should read:

	200	118	0	187	0	0	11	880	48	841	888	0	0	1,787	1,888

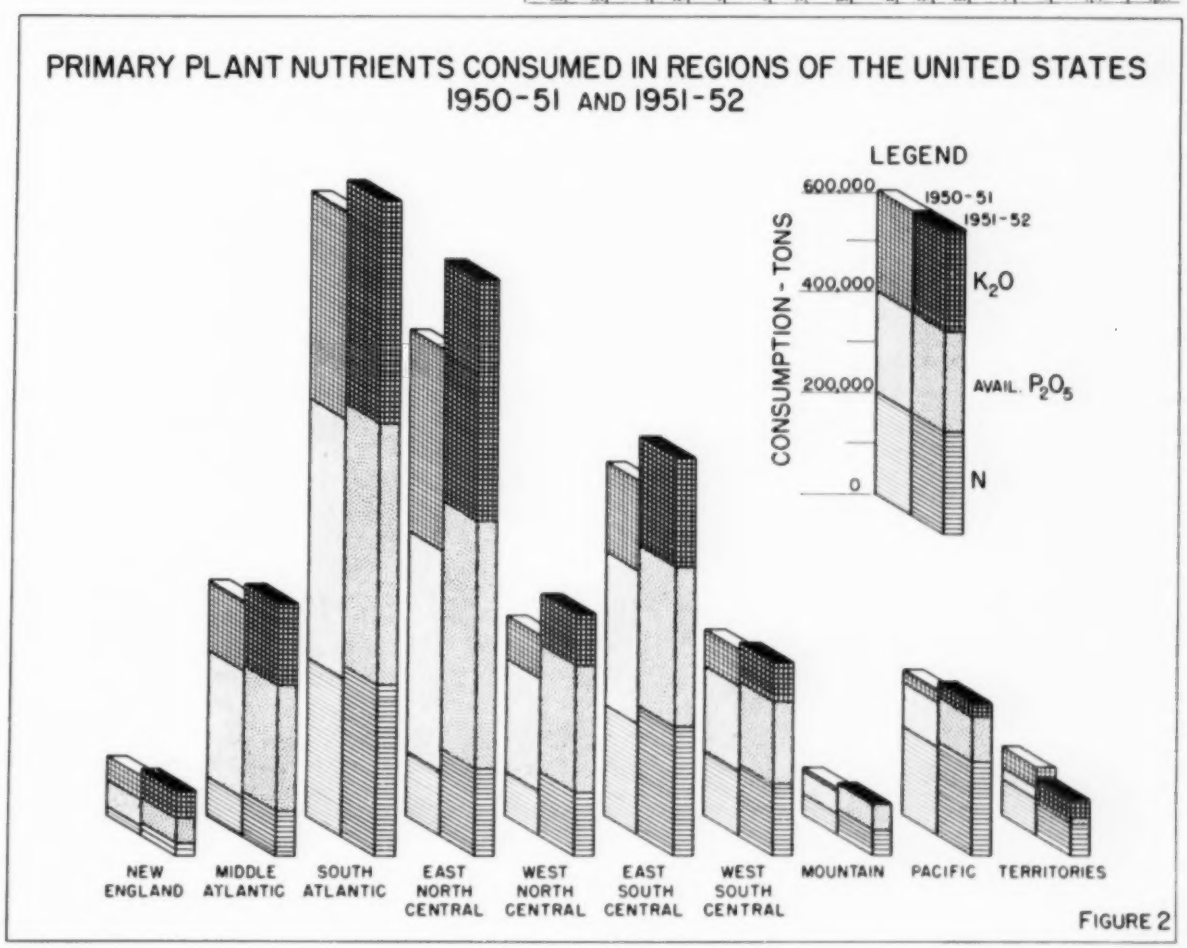


FIGURE 2

Although the number of grades listed in 1951-52 totaled 1,148 and in 1950-51, only 992, it does not necessarily follow that there were actually 156 more grades used in 1951-52. There was, apparently, no substantial increase or decrease in the actual number consumed in the two periods. A large part of the 156 was due to manufacturers listing more grades by their guarantees than were listed in 1950-51.

The 164 grades listed in Table 2 represent 104 different ratios of primary nutrients. Of this number, 12 represent 74.9 percent of the total tonnage of mixed fertilizers consumed in the Continental U. S. These are listed in Table 2a. The four leading grades consumed in the Continental U. S. were 3-12-12 (1-4-4), 5-10-5 (1-2-1)[2], 5-10-10 (1-2-2), and 3-9-6 (1-3-2). These were the nutrient ratios most favored in this country.

TABLE 2a — Principal Ratios of Primary Nutrients of Mixed Fertilizers Consumed in the Continental U. S. Year Ended June 30, 1952.

Ratio	Consumption[1]	Proportion of Quantity of All Mixed Fertilizers
	Tons	*Percent*
0-1-1	784,797	5.30
1-1-1	572,168	3.86
1-2-1	1,025,841	6.93
1-2-2	1,709,354	11.54
1-3-2	1,024,571	6.92
1-3-3	501,610	3.39
1-4-4	756,126	5.10
1-4-4	2,541,223	17.16
1-6-3	512,083	3.46
2-4-3	534,118	3.61
2-5-3	622,084	4.20
4-10-7	508,254	3.43
Total	11,092,229	74.90

[1] Includes all grades having these ratios.

Table 5. - Kinds of fertilizers consumed in regions of the United States, in Tons, During Year Ended June 30, 1952/

Kinds	New England	Eastern	South	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Territories	Total
Mixed fertilizers											
0-1-1	370,132	1,070,000	4,000,000	1,070,000	701,919	1,191,417	498,877	25,007	249,736	207,858	17,814,869
0-2-0	240	100	1,000	800	104,707	947	16,700	33,110	30,708	1,368	279,180
0-4-0	80,979	102,000	181,787	316,000	78,913	206,374	72,700	93	1,000	1,177	1,000,999
0-4-8	3	0	150,000	1,000	17	1,760	17	18	0	1,092	161,790
Mixed fertilizer materials											
Ammonia - superphosphate	0	W	W	W	W	W	W	W	W	W	100,000
Ammonia - urea	0	0	100	W	50	150	W	18	W	0	10,100
Ammonium nitrate	3,000	17,000	40,700	20,200	119,000	200,000	90,700	70,500	275,000	150	795,100
Ammonium nitrate-limestone mixtures	200	1,000	104,307	10,000	10,000	11,000	5,000	0	150	0	237,157
Ammonium sulfate	750	3,000	4,700	61,000	34,000	50,000	43,000	40,000	100,000	74,150	990,917
Calcium cyanamide	150	8,100	15,000	2,000	200	5,000	2,700	800	5,000	200	39,178
Calcium nitrate	0	0	1,000	800	60	4,000	1,000	6,000	51,000	80	63,840
Sodium nitrate	2,780	15,000	100,000	1,000	800	180,000	80,000	3,000	1,000	100	383,780
Other chemical nitrogen materials[2]	500	2,000	10,000	14,000	10,000	30,000	40,000	27,000	80,000	7,000	220,500
Natural materials											
Blood, dried	0	250	40	80	0	0	0	0	1,000	0	1,370
Castor pomace	1,700	60	2,000	0	0	0	0	0	800	0	4,560
Cottonseed meal	0	0	800	0	0	0	0	0	0	0	800
Cottonseed meal	10,800	30	1,100	0	0	0	0	0	20	0	11,950
Fish meal	0	0	0	0	0	0	0	0	800	0	800
Fish scrap, wet meal	700	0	100	0	0	0	0	0	600	0	1,300
Hoof and horn meal	200	0	0	0	0	0	0	0	0	0	200
Sewage, dried	4,000	10,000	5,000	2,000	2,000	800	3,000	1,000	100,000	0	130,000
Sewage sludge, activated	4,500	5,000	5,000	20,000	6,000	1,000	1,000	1,000	10,000	0	53,500
Sewage sludge, other	0	0	0	0	0	0	0	0	20,000	0	20,000
Tankage, animal	0	700	0	0	0	0	0	0	800	0	1,500
Tankage, garbage	0	0	0	0	0	0	0	0	1,000	0	1,000
Tankage, process	1,000	3,000	1,000	80	0	0	0	0	0	0	5,080
Other[3]	500	500	50	0	0	0	0	0	1,000	0	2,050
Phosphatic materials											
Ammonium phosphate, 16-48	0	0	0	200	2,000	0	100	1,000	8,000	3,200	14,300
Ammonium phosphate, 16-20	0	0	0	4,700	30,000	0	60,000	20,000	70,000	1,000	185,700
Ammonium phosphate, 13-39	0	0	0	0	10,000	0	8,000	7,000	0	0	25,000
Ammoniated superphosphate	0	0	800	0	0	0	2,000	0	4,000	0	6,800
Basic slag phosphate	0	100	100	0	0	1,000	0	0	0	0	1,200
Bone meal	0	0	30,000	100	0	300,000	10,000	0	0	0	340,100
Colloidal, raw	500	1,000	1,000	100	0	700	200	0	1,000	0	3,500
Colloidal, steamed	1,000	2,000	200	700	0	200	0	0	0	0	4,100
Calcium metaphosphate	0	0	1,000	1,000	1,000	1,000	1,000	0	100	0	5,100
Mixed hydrated phosphate	0	0	1,700	500	1,000	10,000	0	0	0	0	13,200
Phosphoric acid: Grade 75%	0	0	0	0	0	0	0	0	0	0	0
Phosphate rock	0	0	0	0	0	0	0	0	0	0	0
Phosphate rock	670	1,000	21,000	700,000	470,000	20,000	70,000	700	4,000	1,000	1,000,000
Colloidal phosphate	80	2,000	1,000	10,000	10,000	10,000	1,000	100	0	0	34,100
Precipitated bone	200	0	0	0	0	0	0	0	0	0	200
Superphosphate, 16	1,000	10,000	70,000	40,000	100,000	50,000	500	4,000	70,000	0	300,000
" 18	500	0	1,000	5,000	0	8,000	1,000	10,000	40,000	0	65,000
" 20	11,000	100,000	70,000	70,000	60,000	100,000	200,000	50,000	0	1,000	600,000
" 30	0	0	0	0	700	0	2,000	100	0	700	3,000
" 36	0	0	0	0	10	0	0	0	0	0	10
" 40	0	0	0	0	11,000	0	0	0	0	0	11,000
" 45	0	0	0	0	0	0	0	0	0	0	0
" 48	0	0	0	0	0	0	0	0	0	0	0
" 50	1	100	1	3,000	10,000	2,000	10,000	5,000	10,000	200	50,000
" 60	0	100	0	2,000	10,000	1,000	5,000	800	0	0	19,000
" 80	0	0	0	0	0	0	0	0	0	0	0
" 90	0	0	0	0	0	0	0	0	0	0	0
" 95	0	0	0	0	0	0	0	0	0	0	0
" 96	0	0	0	0	0	0	0	0	0	0	0
" 98	0	0	0	0	0	0	0	0	0	0	0
Potassic materials											
Cement flue dust	0	500	10,000	0	0	500	0	0	0	0	10,500
Potash mull ash	600	0	0	0	0	0	0	0	0	0	600
Potash salts: Grade 50%	0	100	1,500	1,300	0	100	600	0	0	0	3,500
Potassium chromate	0	0	100	0	0	0	0	0	0	0	100
" sulphate: 90-96%	50	800	30,000	20,000	700	30,000	17,000	100	1,000	0	100,000
" " 48%	3,000	5,000	12,000	10,000	10,000	20,000	10,000	80	2,000	1,000	100,000
" magnesium sulfate	50	100	1,000	100	100	1,000	100	0	0	100	3,000
" nitrate	0	0	1,000	0	0	0	0	0	0	0	1,000
" phosphate ash	0	0	1,000	0	0	700	0	0	0	0	1,700
" sodium nitrate	10	20	100	0	200	1,500	0	50	0	0	1,700
" sulfate	200	100	5,500	600	0	5,500	0	10	1,000	0	13,000
Potassic stone	0	0	1,000	0	0	0	0	0	0	0	1,000
Wood ashes	0	100	3,500	0	0	0	0	0	0	0	3,600
Total primary nutrient fertilizers	644,500	2,082,400	5,130,500	4,351,000	1,750,000	3,400,500	1,400,000	500,000	1,100,000	500,000	21,000,000
Secondary & minor element materials[4]											
Ammonium sulfate	0	100	1	0	0	0	0	0	0	0	00
Borax	54	170	200	500	0	800	0	100	300	0	1,500
Calcium sulfate	1,000	1,000	1,500	00	1,000	00	0	10,000	000,000	0	000,500
Copper sulfate	11	00	1,500	100	0	0	0	0	00	0	1,500
Ferrous sulfate	0	0	0	0	0	0	0	0	00	0	00
Magnesium carbonate	0	0	0	0	0	0	0	0	1,000	0	1,000
Magnesium sulfate	00	00	0	00	0	0	0	0	0	0	100
Manganese sulfate	0	00	0,500	000	00	0	0	0	500	0	0,500
Sulfur: Ground	0	00	0,000	00	0	0	0	0	0,000	0	0,000
Sulfuric acid: 60-66°	0	0	0	0	0	0	0	0	0,000	0	0,000
Zinc sulfate	0	00	1,000	0	00	0	0	0	00	00	1,000
Elements not classified	0	0	0	0	00	0	0	0	0	0	00
Total Mex. & minor elem. mat.	1,170	1,270	70,710	800	1,500	700	1,000	10,100	000,800	100	000,000
TOTAL ALL FERTILIZERS	000,700	2,000,000	0,000,000	0,000,000	1,000,000	0,000,000	1,000,000	000,000	0,000,000	000,000	00,000,000

1/ Includes distribution by Government agencies. Does not include materials for manufacture of commercial fertilizers.
2/ Included with "Other chemical nitrogen materials." Regional data cannot be published without disclosure operations of individual suppliers.
3/ Calurea cyanamid, ammonium sulfate-nitrate, nitrogen solutions, urea, and unclassified chemical nitrogen materials.
4/ Does not include above total for mixtures materials.
5/ Miscellaneous seed meals: Linseed (40), Peanut (8), Soybean (32), Tung (15), and unclassified organics (5%).
6/ Includes materials distributed by other than manufacturers of fertilizers.

The 15 principal grades consumed in each Region during the current year are listed in Table 3, with their consumption in each of the respective States of the region. With the exception of Florida and Nevada, these grades represent more than 60 percent of the total mixed fertilizers consumed in each State. Except for these two States and a few Western States, these 15 grades accounted for 80 percent or more of the total State consumption.

The consumption of each class of mixture in the various regions is shown in Table 5. With the exception of the West North Central and Mountain regions, 83 percent or more of all mixtures consumed were N-P-K mixtures. In the Mountain region, N-P mixtures were consumed in the largest amount (60 percent); whereas, in the West North Central region such mixtures, though consumed in a large amount were only 18 percent of the total as compared with 74 percent for N-P-K mixtures.

The relative proportions of the classes consumed in the Continental United States have not changed greatly over many years. In 1941 (2), they were, N-P-K 92 percent, P-K 6 percent, N-K 1 percent, and N-P less than 1 percent. In 1951-52, they were 89, 8, 1, and 2 percent respectively.

The weighted average primary nutrient content of all mixed fertilizers consumed in each State is shown in Table 7. The national average for all mixtures increased from 24.19 percent in 1950-51 to 24.86 percent in 1951-52. This average, in 1951-52, comprised, nitrogen 4.30, available P_2O_5 11.14, and K_2O 9.42 percent. The values for these nutrients repectively were 0.12, 0.11, and 0.44 higher than in 1950-51.

Although the national average for each nutrient increased over that for 1950-51, changes by States and Territories showed variations. The average for nitrogen increased in 40 of these areas, decreased in 9, and in 3 there was no change. The available P_2O_5 increased in 18 and decreased in 34, while K_2O increased in 44 and decreased in 8.

The national average reflected

(*Turn to Page* 119)

Rohm & Haas Announces Availability of new Insecticide

P

NOW being manufactured in limited quantities, a new agricultural insecticide, "Perthane" has been announced by Rohm & Haas Company, Philadelphia. Described as a technical grade of 1,1-dichloro-2,2-bis (p-ethyl-phenyl)ethane, "Perthane" is declared to be of a low order of toxicity and thus offers ample safety in handling and use.

Tests with "Perthane" indicate commercial control of a number of insects including leafhopper on alfalfa and other forage crops; six spotted leafhopper and cabbage looper on lettuce; overwintering sugar beet leafhopper on western range lands; and apple maggot and red banded leafroller on apples. Recommended dosage for forage crops and low growing field crops is one pound of active material per acre and for orchard crops, one pound per one hundred gallons, according to Rohm & Haas.

Application for trademark registration has been made by the company and marketing plans are proceeding. These latter plans call for sale of technical material to manufacturers, a dust base to formulators for the preparation of finished dusts and a wettable powder and emulsion concentrate to distributors. The price of the technical grade has been set by Rohm & Haas, tentatively, at 60¢ a pound.

The company states that results of toxicological tests indicate that the new material provides an adequate margin of safety to users. It gives the acute oral LD-50 for rats as 8170 ± 500 mg/kg; for mice as 9340 ± 120 mg/kg. Comparative acute oral LD-50's, as given by Dr. A. J. Lehman, U. S. Food and Drug Administration, are as follows: Methoxychlor, 6000; "Rhothane" (DDD), 3400; DDT, 250; nicotine, 50 to 60; rotenone, 132; toxaphene, 69; aldrin, 67; and parathion, 3.

Rohm & Haas report further that on the score of chronic percutaneous toxicity, 3cc/kg of 30% "Perthane" in dimethyl phthalate by daily inunctions was tolerated for 13 weeks by rabbits. The same dose of "Rhothane" killed all animals in three weeks, as did 1 cc/kg of 30% DDT.

A chronic toxicity two-year feeding test with rats at 100, 500, 1,000, 2,500, and 5,000 ppm. has now gone through the fifteenth month with no adverse effects on survival or rate of growth being noted even at the high levels of administration, the company reports. One-year feeding tests on dogs at 100, 1,000, and 5,000 ppm. are under way at present.

Rats fed 50 ppm. radioactive "Perthane" in their diet for six weeks showed 19 ppm. in the fat, representing about 1/10th the storage which results from feeding DDT under the same conditions, it is estimated.

In the light of "Perthane's" low toxicity, its makers state that the following uses of the material appear to hold most promise for commercial development: On forage crops, "Perthane" shows excellent control of leafhopper and good control of Egyptian clover weevil, alfalfa caterpillar and Lygus. On lettuce, excellent control of six spotted leafhopper and cabbage looper has been obtained. On range lands in California, good control of the overwintering sugar beet leafhopper has been shown. Among orchard crops, tests have shown excellent control of the apple maggot and red banded leafroller on apples and good control of orange tortrix and other fruit worms on citrus fruits. On sweet corn, tests show good control of the sap beetle, and "Perthane" appears to be effective against the various leaf-eating insects attacking cole crops. Home gardeners are expected to find "Perthane" useful in combinations which include "Dithane Z-78" and an insecticide of the type of "Malathon."

"Perthane" is reported to be chemically stable, both in the technical grade and in formulations.

Several important insect pests reported to be controlled by new compound. Tests indicate adequate margin of safety for users. Marketing plans include manufacturers and formulators, the makers report.

How Widespread is

Fertilizer Use of Wetting Agents?

HOW widespread through the fertilizer industry in the U.S., is the use of wetting agents in manufacturing mixed fertilizers? Are manufacturers using these agents to any significant extent, and if so, what are the results they find?

These questions have been at least partially answered through a recent survey conducted by Ultra Chemical Works, Paterson, N. J., which submitted to 250 manufacturers of mixed fertilizers, a questionnaire making inquiry about the use of these materials in making mixed goods.

According to the New Jersey firm's sales department, 49 replies were received to indicate a general interest in the subject on an industry-wide basis. The variation in answers probably indicates a considerable difference in operating conditions from plant to plant and in types of fertilizers required in different parts of the country, the firm comments.

The following is a summary of "yes" and "no" replies received by the New Jersey firm. It is presented here without comment, since the answers carry their own weight in most cases.

The basic question was:

"Have you been experimenting with wetting agents in the manufacture of fertilizer?"

Yes — 31
No — 12
No Answer — 2 (but four others who checked "No Answer" did reply to following questions.)

The 31 manufacturers who were experimenting with wetting agents answered the next questions as follows:

"Have you found that wetting agents reduce the blocking of superphosphate in the pile?"

Yes — 6
No — 4
Undecided — 3
No Answer — 18

(Probably the rather high percentage of those not answering the question was due to the fact that only a small number were manufacturers of superphosphate.)

"Have you found that wetting agents reduce the blocking of mixed fertilizer in the pile?"

Yes — 11
No — 7
Undecided — 3
No Answer — 10

"Have you found that wetting agents reduce the blocking of mixed fertilizers in the bag."

Yes — 16
No — 5
Undecided — 4
No Answer — 6

"Does the use of wetting agents reduce the curing time?"

Yes — 15
No — 4
Undecided — 5
No Answer — 7

The next two questions were designed to see whether there was a relation in the effectiveness of wetting agents when ammonium nitrate and ammonia solution were used as compared with urea-ammonia solution. The 31 experimenting with wetting agents answered as follows:

"Do you use ammonium nitrate?"

Yes — 21
No — 7
No Answer — 3

"Do you use urea-ammonia solution?"

Yes — 15
No — 13
No Answer — 3

The 21 who used ammonium nitrate answered the previous three questions as follows under column I. The answers of the 15 using urea-ammonia are listed under column II.

"Have you found that wetting agents reduce the blocking of mixed fertilizer in the pile?"

	I	II
Yes —	**8**	**4**
No —	**3**	**4**
Undecided —	**3**	**1**
No Answer —	**7**	**6**

"Have you found that wetting agents reduce the blocking of mixed fertilizer in the bag?"

	I	II
Yes —	**11**	**7**
No —	**3**	**3**
Undecided —	**4**	**2**
No Answer —	**3**	**3**

"Have you found that wetting agents reduce the curing time?"

	I	II
Yes —	**11**	**8**
No —	**3**	**1**
Undecided —	**4**	**2**
No Answer —	**3**	**4**

In contrast to the first question, the phrase "Have you been experimenting....." was changed to:

"Have you been using wetting

Here are opinions of fertilizer manufacturers regarding their use of wetting agents in making mixed goods. Reports on the utility of agents seems divided, but many indicate curing time is reduced; others say blocking in pile is much less.

agents in the manufacture of fertilizer?" The following replies were received:

Yes — 22
No — 19
No Answer — 9

The 22 using wetting agents in fertilizers answered the other questions as follows:

"Have you found that wetting agents reduce the blocking of the superphosphate in the pile?"

Yes — 6
No — 4
Undecided — 2
No Answer — 10

"Have you found that wetting agents reduce the blocking of mixed fertilizer in the pile?"

Yes — 12
No — 2
Undecided — 3
No Answer — 5

"Have you found that wetting agents reduce the blocking of mixed fertilizer in the bag?"

Yes — 15
No — 2
Undecided — 3
No Answer — 2

"Does the use of wetting agents reduce the curing time?"

Yes — 14
No — 1
Undecided — 3
No Answer — 4

Those 22 who indicated that they were using wetting agents rather than just experimenting indicated their use of ammonium nitrate and urea-ammonia solution as follows:

"Do you use ammonium nitrate?"

Yes — 16
No — 5
No Answer — 1

"Do you use urea-ammonia solution?"

Yes — 11
No — 8
No Answer — 3

Under column I below are listed the replies of the 16 using ammonium nitrate, and under column II the replies of the 11 using urea-ammonia solution.

"Have you found that wetting agents reduce the blocking of mixed fertilizer in the pile?"

	I	II
Yes	**8**	**4**
No	**1**	**2**
Undecided	**3**	**4**
No Answer	**4**	**4**

"Have you found that wetting agents reduce the blocking of mixed fertilizer in the bag?"

	I	II
Yes	**12**	**6**
No	**1**	**2**
Undecided	**3**	**2**
No Answer	**0**	**1**

"Have you found that wetting agents reduce the curing time?"

	I	II
Yes	**11**	**6**
No	**0**	**1**
Undecided	**4**	**2**
No Answer	**1**	**2**

(The apparent error in the total is due to the fact that some used both ammonium nitrate and urea-ammonia solution, whereas some used neither one).

Summary

Six of the experimenters and the users indicated that wetting agents reduced blocking of superphosphate in the pile, four disagreed, and two and three respectively were undecided.

Eleven of the experimenters and twelve of the users indicated that wetting agents reduced blocking of mixed fertilizers in the pile. Seven of the experimenters and two of the users disagreed and three and five respectively were undecided.

Sixteen of the experimenters and fifteen of the users indicated that wetting agents reduced blocking of mixed fertilizer in the bag. Five of the experimenters and two of the users disagreed and four and three respectively were undecided.

Fifteen of the experimenters and fourteen of the users indicated that wetting agents reduced the curing time. Four of the experimenters and one of the users disagreed, whereas five and three respectively were undecided.

No conclusive trend is revealed when the ammonium nitrate and urea-ammonia solution are brought in. The proportion of replies favorable to the use of wetting agents remains approximately the same.★★

Minor Element Problems

THE first reason for application in spray form is the slight response to soil applications. This may be an almost total lack of response unless very large amounts are used, or it may be a slow response which is too delayed to have value in rapidly growing crops. In other words, if soil applications are not satisfactory, you turn to sprays.

The second reason for turning to sprays is a question of economy. Sometimes reaction could be obtained from soil applications of very large magnitude or after prolonged periods of time, while results can be obtained quickly from spray applications and with much smaller amounts of the material. Since some of the salts of these minor elements are expensive and the supply is short, over-all economy would tend to favor spray applications.

In many areas, the limiting factor in spray applications is the cost of spraying, if spraying is not already being done for other reasons. In many areas where spray equipment is not readily available, to attempt to use minor element sprays on crops would require the purchase of equipment and the instituting of an expensive procedure. In Florida, minor elements are simply added to applications of spray that will be put on anyway.

Part II

Likewise, in many areas, spraying would become extremely difficult. Taking the problem outside of the United States, it should be mentioned that in Costa Rica, extensive zinc deficiency has been found in coffee in the highlands; but with coffee being planted thickly on very steep slopes, the problem of spraying would be extremely difficult if not impossible. The emphasis must be placed on the finding of some form of zinc which can be applied to the soil, although up to now no satisfactory responses have been obtained from soil applications. There are many crops and conditions in the world that would almost defy a spray program, and for such areas the problem of finding materials that will keep the minor element in question in available form is of the utmost importance.

Pest Threat Increased

IN Florida citrus, another problem has entered the picture which is of great importance to us, but not important in many other crops; particularly vegetable crops and pastures. This has to do with the increase in insect infestations following applications of nutritional sprays. Some of this increase may be associated with mechanical problems having to do with the presence of a finely divided residue on the surface of the leaves, which acts very much like sand on an icy sidewalk. The other factor involves the question of diseases of insects.

Copper, zinc and manganese tend to reduce the incidence of the fungus and bacterial diseases which tend to keep down the insect pests and result in increased populations which are difficult to control. Certainly in the case of zinc and copper, scales and certain types of mites tend to build up rapidly following applications of these elements and our emphasis has been on keeping down spray applications as much as possible.

This problem has also led to the development of a number of very concentrated spray materials, which tend to reduce the poundage of residue on the leaves and thus relieve the mechanical factor which appears to be a very important one in the establishment of young scales, for instance.

While this problem is paramount in Florida, it may not be of particular importance in many other crops and particularly in truck crops, so our anxiety to get away from spray applications should not be misread by

—Paper presented at meeting of National Agricultural Chemicals Association, New Orleans, La., March 13, 1953.

by
A. F. Camp

Vice-Director in Charge
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Lake Alfred, Fla.

people working in other fields. We feel inclined to believe that similar results will be found eventually on most orchard crops, but on truck crops and other row crops, this may never be a factor.

The materials used in nutritional sprays in the beginning were largely the sulphates, neutralized with lime or lime sulfur where citrus was concerned but in un-neutralized solutions for many vegetable crops. The determining factor here is apparently the leaf structure and the leaf metabolism and burn is a secondary consideration. (though in some cases burn can be experienced from un-neutralized materials.)

A great deal of effort has been spent in Florida on the development of substitutes for sulphates neutralized with lime. As a result of the emphasis on build-up of scale following applications of Bordeaux, we turned to the use of such materials as monobasic and tribasic copper sulphate and cuprous oxide. These materials leave much less residue on the plant than Bordeaux, while applying the same amount of copper, and the result is a much smaller build-up of scale.

More recently, certain neutralized compounds of zinc have been developed which are being used successfully, and a small amount of neutral manganese is being used. These materials are no more efficient as far as correcting copper, zinc or manganese deficiency is concerned than are the lime neutralized sulphates of the elements, but do have the advantage of leaving less residue on the leaves to favor scale build-up.

In many crops, this would not be of particular importance. The development of a satisfactory material for this use is not easy because some materials will be too soluble and produce burn, and some of them will be too insoluble and give no results. A good deal of experimental work has to be carried out in order to develop a material of satisfactory characteristics.

Molybdenum Important

MOLYBDENUM, which has recently entered the citrus picture in Florida as a corrective for the old "yellow spot" which has been known in this state for perhaps fifty years, is in a different category. It is applied in the form of sodium molybdate at the rate of one ounce per hundred gallons of spray except in severe cases of yellow spot, when it may be used at two ounces. Ammonium molybdate will do the same thing, but sodium molybdate is commonly used.

This paper will not go further into the problem of nutritional sprays, because the basic fact is that in a great many plants, zinc, copper, manganese, molybdenum, boron and occasionally magnesium can be applied, where necessary, in the form of sprays. However, the form in which it is to be applied and the dosage will have to be determined for individual plants and conditions. It will never be safe to generalize from one plant or condition to another.

For experimental trials, either solutions of the sulphates or the sulphates neutralized with hydrated lime are highly satisfactory. Ofttimes, as a systematic measure, other compounds will be found more desirable for a variety of reasons, one of which may be compatibility with existing spray materials, thus making it possible to avoid an extra application of spray in order to apply a nutrient.

Problems connected with soil applications are more complicated than those connected with sprays, because the soil composition is a large factor in their success or failure. Such things as pH, residual calcium carbonate, phosphate content, etc., are controlling factors on the usability of soil applications. There are also some factors that have not yet been unravelled, but which operate very strongly in the case of zinc and iron.

It is well known that high alkalinity may operate adversely on the availability of such materials as copper, manganese, zinc and iron. This may bring on deficiencies and at the same time prevent satisfactory results from soil applications. This fixing power as related to pH is readily understandable, but there are also other factors. Copper, for instance, which should be highly soluble on acid soils, is strongly absorbed by organic matter, as pointed out by Jamison a good many years ago and by Wander more recently.

In using soil applications of copper, it is necessary to use enough to satisfy the fixing power of the soil before an overage is left for utilization by the plant. When this fixing power becomes saturated, then probably much smaller amounts will suffice for crop utilization. Iron, while known as a deficiency in alkaline soils, may also be sharply deficient at very low pH's, (probably due to precipitation of iron phosphate) while molybdenum may be deficient because of the insolubility of molybdic acid.

Manganese sulphate applications on acid soils generally correct the deficiency of this element, but there is a tendency for manganese sulphate to move gradually in the direction of insoluble manganese oxide and applications need to be repeated.

In the case of boron deficiency on acid soils, it probably is not a case of fixation so much as it is a case of leaching.

In zinc deficiency, there are factors which are not well understood and which still need elucidation. Zinc sulphate applied to the soil proved to be a very satisfactory corrective for zinc deficiency in tung oil

in north Florida, Alabama and Mississippi and for zinc deficiency of citrus in the sandy soils around Gainesville, Florida. Further south in the citrus belt, however, and on very similar soils, zinc has not been very satisfactory as a soil application and very commonly must be used as a spray. The same thing happened in the case of coffee in Costa Rica, where on an acid soil, zinc applications to the soil have been complete failures whereas zinc sprays have given almost miraculous results. Also in Argentina and Brazil on citrus and in many other places in the world.

This does not seem to be related to organic matter, as is the case with copper, but certainly some factor involved in many soils and under a great variety of conditions seems to tend to prevent the intake of zinc by plants when zinc sulphate is absorbed by the soil. This does not necessarily extend to all plants in the area, however.

Slowly Available Elements

UP to recently, common soil applications for the correction of deficiencies of copper, zinc and manganese were the low grade sulphates of these materials. On acid soils, these have worked quite satisfactorily and constitute usually the cheapest soluble form of the element. A great deal of interest, however, has been aroused in another line of research, and that is the application of these things in slowly available forms. This is essentially what the old citrus grower used when he applied coarse granular copper sulphate, frequently using crystals as big as the end of a man's thumb. These crystals broke down very slowly and frequently were present in the soil a year after application, thus furnishing a slowly available source of copper.

Attempts to do the same thing with an artificial lump of zinc sulphate did not succeed, however. This sort of research is still going on, with much interest in the possible utilization of crude minerals but very little in the way of satisfactory results. All of us are looking for something that we can apply once every twenty years, thus getting rid of the problem of repeated applications.

Cuprous oxide has shown itself to be a quite satisfactory source of copper on sandy soils in Florida, though it is a relatively insoluble material, whereas somewhat similar compounds of manganese and zinc have been complete failures. The reason for this probably lies in the fact that the fixation of copper in these acid soils is related to organic matter fixation rather than precipitation of insoluble materials. While manganese sulphate moves rather rapidly in the direction of insoluble manganese oxide, copper applied to the soil results in a combination between copper and the organic matter in which the copper is not so tightly held. Under such circumstances, a partially reacted manganese sulphate might prove quite unsatisfactory whereas cuprous oxide (which is relatively insoluble) has proven to be satisfactory.

The biggest recent development in minor element work has been the finding by Stewart and Leonard of the Citrus Station that iron in the chelated form could remain soluble in the soil until picked up by citrus trees and consequently iron deficiency on acid soils could be corrected with this material. This finding offers enormous avenues for research, since applications of other forms of iron to the soil had not given results and with most plants, iron sulphate sprays have not been satisfactory, whether neutralized or un-neutralized.

In citrus, such sprays produced only a speckled greening-up of the leaves and no satisfactory recovery, and the same has been the case for many other plants. While we had been successful in developing means of correcting copper, zinc and manganese deficiencies as well as those of boron and molybdenum, iron remained a very real problem and a very difficult one. The solution of the iron deficiency problem on acid soils has stimulated research along this line and it is probable that very great developments may be expected in the next few years. The same principles may be applicable to other things besides iron, such as zinc, copper, manganese and even perhaps molybdenum.

The action of chelates is familiar, and the particular one used in this case is known as "Sequestrene" or "Versene." These complex organic compounds will combine with iron in such a way that the iron remains soluble but not ionized and does not react readily with a fixing material such as phosphate.

These materials have been used in water conditioning to keep iron soluble and consequently are not new, but the application made by Drs. Stewart and Leonard was new and has had a greatly stimulating effect upon minor element research. The iron is reacted with the chelating agent and the mixture, which may contain 8% or 12% soluble iron. It is added to the soil around the tree and recovery of trees that had been acutely deficient in iron for years is almost miraculous. The material developed to date has worked satisfactorily only for acid soils and the applications have had to be excessive where iron deficiency is associated with highly alkaline soils, as on the East Coast of Florida. However, extensive research is under way to develop a similar compound that will remain soluble on alkaline soils and thus offer a solution to this very critical problem in our East and West Coast areas where iron deficiency is brought on by high alkalinity.

The work has rapidly extended beyond citrus to many other crops and there has been notable utilization on such things as azaleas, which suffer chronically under certain conditions from iron deficiency. Parallel work is also under way looking to the development of a chelated zinc if this is possible. Such a compound might be a life-saver for many tropical areas where zinc deficiency is becoming an increasingly important problem, and where spraying is almost an impossibility. Just what the possibilities of research along this line are, it is difficult to say, but certainly it is opening a startling new avenue of research on minor elements and may be expected to contribute very greatly to the future of this field.★★

1953 Meeting Program for

Nat'l Fertilizer Association

FOR its 28th annual convention, the National Fertilizer Association has arranged for the following program at the Greenbrier Hotel, White Sulphur Springs, West Virginia. The activities will begin Sunday evening, June 14, with registration, and the actual program is scheduled to begin Monday morning.

The program, as listed by the NFA shortly before meeting time was as follows:

Monday Morning
June 15

8:00 a.m. Breakfast Meeting — Committee on Publications (Greenbrier Suite)

9:45 a.m. Meeting of the Board of Directors (Washington and Lee Rooms)

9:45 a.m. Open Meeting of the Plant Food Research Committee (Auditorium)
All those attending the convention are cordially invited. Topic of discussion:
"Efficient Water Utilization"
PARTICIPANTS
Chairman: H. H. Tucker, Director, Coke Oven Ammonia Bureau, Inc., Columbus, Ohio
W. B. Camp, W. B. Camp & Sons, Inc., Bakersfield, California
R. Q. Parks, Manager, Agricultural Service, Grace Chemical Co., Memphis, Tennessee
James E. Ferguson, Sprinkler Irrigation Association, Washington, D. C.

Monday Afternoon
June 15

4:00 to 5:00 p.m. Garden Party for the Ladies (Old White Patio)

Monday Evening
June 15

6:30 p.m. Refreshment Hour — American Potash & Chemical Corporation (President's Room)
Refreshment Hour — H. J. Baker & Bro. (Ballroom)

9:00 p.m. Nominating Committee Meeting (Washington Room)

9:00 p.m. to 10:30 p.m. Reception — Southwest Potash Corporation (Virginia Room)

9:00 p.m. to 1:00 a.m. Cabaret Party — Music and Dancing (Auditorium)
Please provide your own refreshments

Tuesday Morning
June 16

8:00 a.m. Breakfast Meeting — Plant Food Research Committee (Lee Room)

9:00 a.m. Registration continued

9:45 a.m. General Meeting
Auditorium
(Ladies invited)
Chairman Louis Ware presiding
Song: America
Invocation: Dr. D. L. Beard, Minister, Presbyterian Church, White Sulphur Springs
Annual Convention Address: Louis Ware, Chairman of the Board of Directors
Address: "The Solid Future for Agriculture." Honorable True D. Morse, Under Secretary of Agriculture, Washington, D. C.
Address: "Under New Management in Washington," Honorable Charles A. Halleck, Majority Leader, U. S. House of Representatives
Report of the Nominating Committee: Howard A. Parker, Chairman
(Several Directors-at-Large and several District Directors are to be elected. If there are nominations from the floor, the ballot box will be open at the registration desk from 1 p. m. to 5 p. m.)
Submittal of the Budget: J. H. Epting, Chairman, Budget Committee

Tuesday Afternoon
June 16

2:00 p.m. Ladies' Bridge and Canasta Party (Trellis Lobby)

Tuesday Night
is
Festival Night

6:00 p.m. Refreshment Hour—International Minerals & Chemical Corporation (Ballroom)

7:30 p.m. Convention Dinner (Main Dining Room).
No speeches. If you wish to have a party group of your own, please make arrangements with the maitre d'hotel. (Extra charge for banquet and gratuity will be added to your bill)

9:15 p.m. Entertainment — Charles Vance, internationally known artist, will present a program of mystery, magic and merriment.

10:00 p.m. to 1:00 a.m. Dancing in the Ballroom. There will be tables for those who wish to sit and enjoy the music.

Wednesday Morning
June 17

9:45 a.m. General Meeting
Auditorium
(Ladies invited)
Chairman Louis Ware presiding
Annual Convention Address: President Russell Coleman
Panel Discussion: "Proper Use of More Fertilizer"
PARTICIPANTS
Moderator: Roy Battles, Assistant to the Master, The National Grange, Washington, D. C.
Milton C. Cummings, President, Farmers and Merchants State Bank, Effingham, Kansas, representing the credit agencies.
Werner L. Nelson, In Charge, Soil Fertility Research.

(*Turn to Page* 147)

Desirable physical and chemical properties claimed for this new

Copper Fungicide

COPPER is known to exist in a variety of normal and basic salts and in an almost limitless number of organic complexes. Copper sulfate, for instance, has been used in Bordeaux mixture since 1882-85 in the control of various plant diseases with consistent success. This has led to the testing of other forms of copper for fungicidal properties, with the result that many copper compounds are now widely employed in place of, or to supplement, Bordeaux mixture.

Apparently copper in almost any combination can serve as a fungicide if the other elements with which it is combined are not harmful and if the solubility of the copper permits its release rapidly enough to kill or inhibit fungi but not so rapidly as to injure cells of the host plant.

Solubilities of the commercially important fixed (sparingly soluble) coppers fall within the range (of) 4×10^{-4} to 4×10^{-6} gms/100 ml. when measured under conditions similating leaf exposure. Compounds with greater solubility are too toxic for use on plants. At the other end of the scale are compounds in which the copper is too tightly held to have fungicidal value. Within the useful range there is a tendency for the most soluble compounds to be the most toxic and the least soluble the least toxic, but such generalization is not valid because of the influence of other factors.

The desirability of a specific copper compound as a fungicide will depend upon other considerations such as cost and physical characteristics that determine how well the material handles during application, how well it sticks originally, how long it is retained on the leaf, the nature of the residue, and its resistance to weathering.

There is general agreement that copper residues retain their effectiveness as long as they remain on the leaf, whereas the organic compounds lose their effectiveness within 5-6 days. It appears to be generally agreed that cuprous oxide is more effective than cupric oxide when used

Figure 1

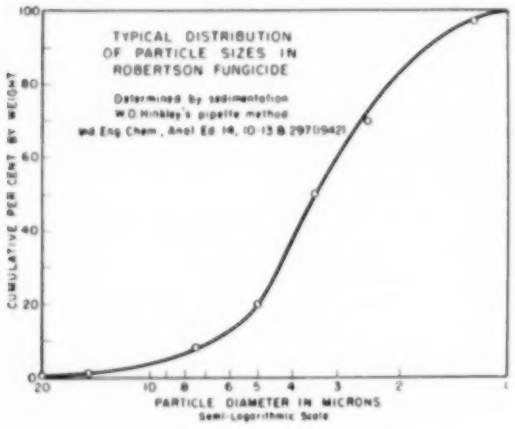
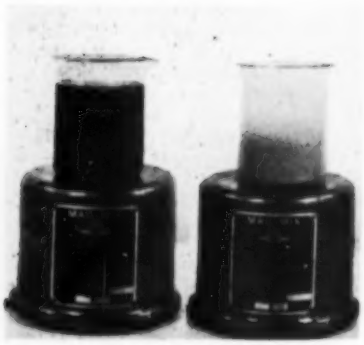


Figure 2



Small volume and free-flowing property of Robertson fungicide* make it easier to disperse and keep in suspension, the makers state. At left: water suspensions (at 8x) of Robertson fungicide. At right, cupric sulfate, which received the same amount of stirring.

*This product is made by H. H. Robertson Company, Pittsburgh, Pa.

by
Dean S. Hubbell

Senior Fellow
Mellon Institute of Industrial Research
University of Pittsburgh
Pittsburgh, Pa.

in fungicides for controlling plant diseases and also in antifouling pigments.

Robertson Fungicide has proved a good source of cuprous copper. It has a core of metallic copper and a covering of cuprous oxide. Since the

Figure 4

Figure 3

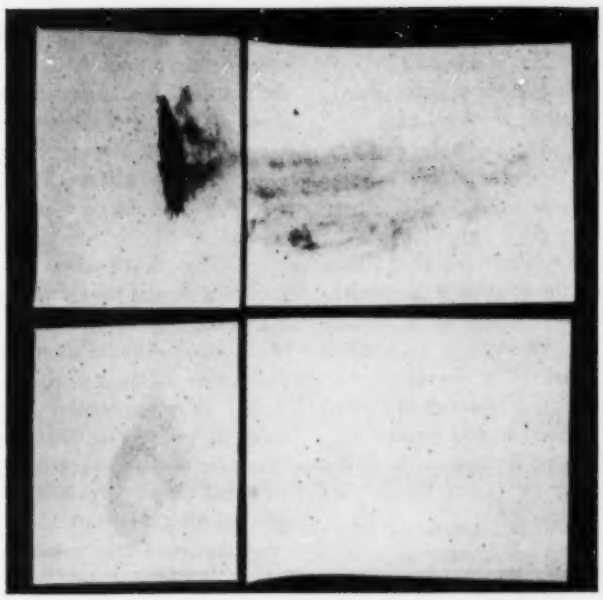


Figure 3 (above): A simple test of adhesion is to slide some of the material in question from one sheet of paper to another. Robertson fungicide (left) is compared with tribasic copper sulfate (right).

Figure 5

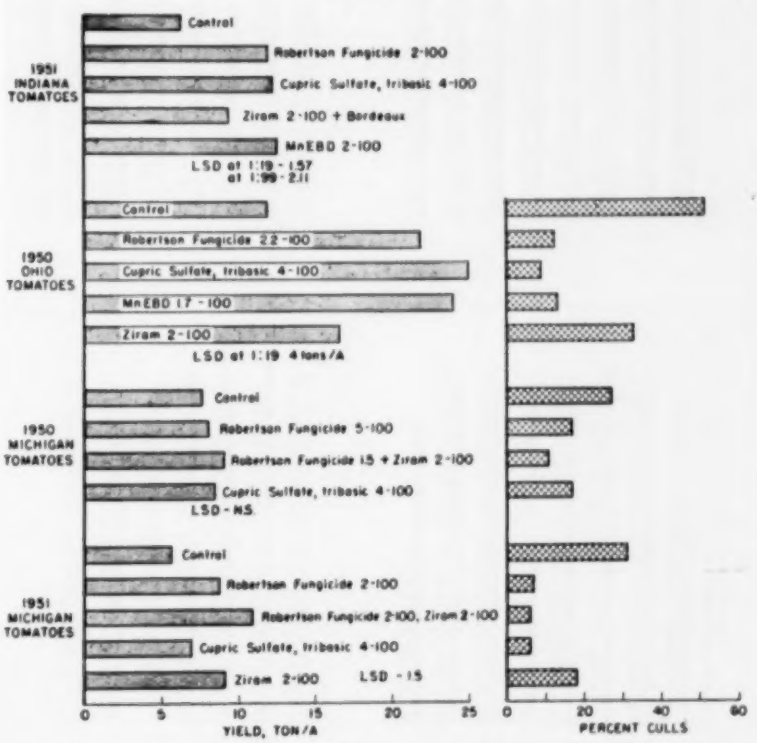


Fig. 5
COMPARISON OF SEVERAL FUNGICIDES IN WET YEARS
1950 AND 1951 FIELD TESTS

cuprous oxide stands between the metallic copper and the rest of the world, the particle behaves chemically as if it were entirely cuprous oxide; as the cuprous oxide film is depleted by exposure on a leaf, more of it is formed from the metallic copper core.

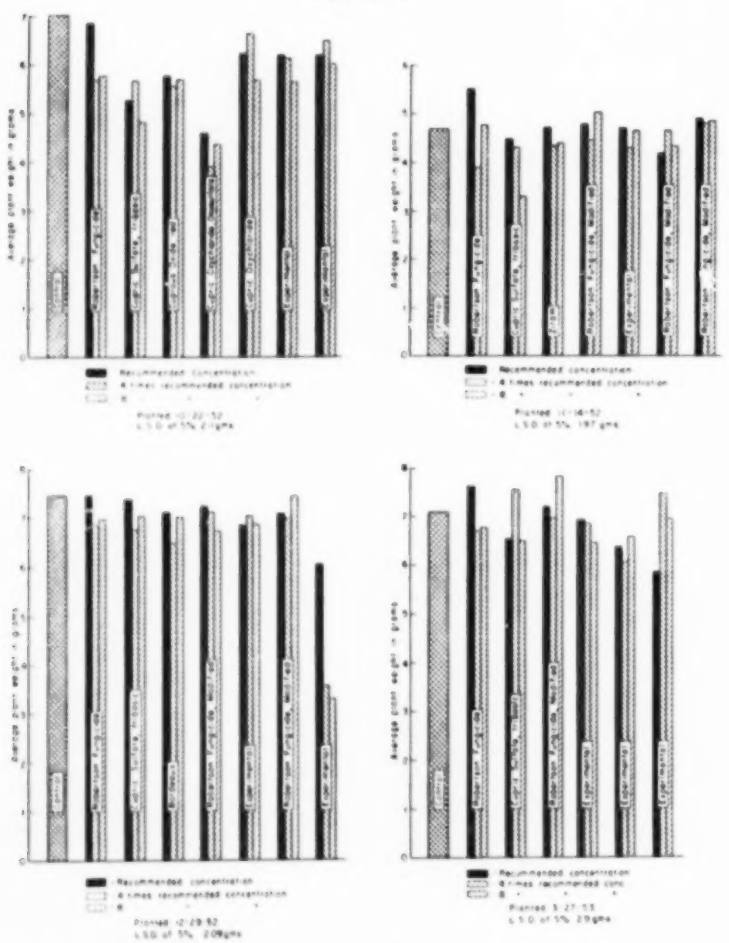
Both copper and cuprous oxide, when finely divided, readily oxidize to cupric oxide, which is not effective as a plant fungicide. It is therefore rather surprising that a film of one over the other is stable under conditions where either alone would be oxidized. Presumably each protects the other. The cuprous oxide film, when formed under proper conditions, is continuous and protects the core by denying it oxygen. It is itself stabilized by contact with the metallic core.

Small Particle Size

AN individual particle of Robertson Fungicide is exceedingly small; more than 14.7 trillion are contained in a pound. Consequently, the powder has a large surface area—about 10,000 times the area it would have if it were a single sphere. Despite its large surface, it stores remarkably well for the reason given above.

The distribution of particle sizes of a typical sample of Robertson Fungicide is shown in Figure 1. Most of the material lies in the range below 5 microns while less than 5% by weight of the particles are greater than 10 microns in diameter. The "average particle diameter," as determined by air permeability, is approximately 2 microns.

Figure 6



PHYTOTOXICITY OF SEVERAL FUNGICIDES ON BEAN PLANTS

These figures perhaps have little significance in themselves except to indicate that the powder will suspend well and pass freely through hose lines and nozzles. They also show that there will be enough particles to give adequate coverage. Applied at the rate of 2 lbs./acre, there will be four million particles per square inch. A residue of this density is not visible and certainly not voluminous enough to interfere with respiration or photosynthesis of the leaf. The surface area of such residue, measured by low temperature nitrogen absorption, is approximately 10,000,000 square centimeters. Thus, there is ample surface for the release of cuprous ions to moisture films. Moreover, the particles will be spaced not more than five ten-thousandths of an inch apart, whereas their sphere of influence has been found to extend much farther than this.

The particles of Robertson Fungicide are easily wetted with water or organic liquids and disperse well. Surfactants are not required. Their specific gravity is 7.3; their bulk density 18.5 lbs./gallon.

Suspension Properties

DOSAGE is based on copper content and is accordingly half or less than half that of most other copper fungicides. This fact, plus the high specific gravity of the particles, has led to fears that settling in the spray tank might be troublesome and might lead to poor distribution. Rather surprisingly, such fears have proved groundless in actual use with a wide variety of spray equipment—even in knapsack sprayers where the only agitation is the man's shoulders. The small volume and free-flowing nature of Robertson Fungicide make it easier to disperse and keep suspended than some of the more voluminous materials, especially those that tend to become gummy. The simple comparison illustrated in Figure 2 shows that it requires no more agitation than a lighter, more voluminous material that is widely used.

Adhesion is another property in a fungicide that is difficult to explain

(*Turn to Page 159*)

Program for Eighth Annual Meeting

American Plant Food Council

WITH registration starting on Thursday, June 11, and a meeting of the board of directors that night, the American Plant Food Council holds its eighth annual convention at the Homestead Hotel, Hot Springs, Va., June 11-13.

The convention proper begins Friday morning, June 12, in the Homestead's theater auditorium, with invocation and a reading of a Resolution in Memoriam, the latter being presented by R. R. Hull, chairman of the Memorial Committee.

The remainder of the meeting follows, continuing the Friday morning program:

10 a. m. Address:
Paul T. Truitt
President, American Plant Food Council, Inc.

10:20 a. m. Address:
"Changing Policies in the U.S.D.A."
Hon. J. Earl Coke
Assistant Secretary of Agriculture, U. S. Department of Agriculture

10:50 a. m. Address:
"Farm Prices and Production"
Dr. T. K. Cowden
Head, Department of Agricultural Economics, Michigan State College

11:20 a. m. Presentation:
Soil Builders Award
Louis H. Wilson
Secretary and Director of Information American Plant Food Council

11:30 a. m.
Committees and Announcements

11:35 a. m. Annual Business Meeting
Reports of Committees:
Credentials Committee, G. Dexter Sloan, chairman
Nominating Committee, C. B. Robertson, chairman
Election of Members to the Board of Directors

11:45 a. m. Adjournment
(The afternoon programwill include golf and tennis and social events for the ladies present.)

9:00 to 11:30 p. m. After-Dinner Reception
Courtesy, Southwest Potash Corp.

9:00 to 11:30 p. m.
A.P.F.C.'s new TV shorts, showing every half hour:
"7000 More for Dinner"
"Your 'Steak' in Pastures"

Saturday, June 13

9:45 a. m. Address:
"Congress and Farm Policy"
Hon. Clifford R. Hope (Kansas)
Chairman, House Committee on Agriculture

10:15 a. m. Agricultural Forum:
"Fertilizers Blaze New Trails Across the Nation."

Introduction
Dr. John R. Taylor, Jr.

Moderator
Dr. Paul D. Sanders
Editor, The Southern Planter

Representing the Far Western Section of the United States:
Dr. W. E. Martin
Extension Soils Specialist
University of California

Representing the Midwestern Section of the United States:
Dr. Arnold W. Klemme
Extension Specialist in Soils
University of Missouri

Representing the Southeastern Section of the United States:
H. A. Woodle
Leader,
Agronomy Extension Work
Clemson Agricultural College

Representing the Northeastern Section of the United States:
Lester H. Smith
Extension Agronomist
University of Vermont

11:20 a. m. Address:
"Looking at Business"
H. H. Maynard
Chairman, Department of Business Organization
Ohio State University

11:45 Announcement and Adjournment
(As on the previous day, the afternoon program consists of golf and tennis and social events for the ladies present.)

6:30 p. m. Hospitality Hour
Courtesy Potash Company of America

7:45 p. m. Annual A.P.F.C. Banquet
Soloist, Felix Knight, tenor

9:00 p. m. Address
"Political Horizons"
Hon. Walter H. Judd
Minnesota, member, U. S. House of Representatives

9:45 p. m. Intermission
10:30 Dancing

Sunday, June 14

9:30 a. m. Breakfast Meeting
Board of Directors

Calspray Seeks Review of Court Case Involving $30,000 Damage Award

LATE in May, California Spray-Chemical Corporation was working toward getting a review by the Virginia Supreme Court of Appeals which earlier had ruled in favor of a Virginia apple grower who sought damages from Calspray because of alleged injury to an orchard. The suit involved use of Calspray's mercurial fungicide, "TAG".

The original action, (McClanahan v. California Spray Chemical Corp.), tried before a jury in the Albermarle County Circuit Court, was premised on violation of the statutory provisions of both Federal and Virginia State Insecticide, Fungicide and Rodenticide Acts. The applicable provisions of these acts require in substance that products covered by the acts must carry a label containing warning and caution statements which, if followed, shall be adequate to prevent injury to useful vegetation.

The "TAG" label, it was brought out at the trial, carried directions for use which advised the grower not to apply the spray after petal fall. The spray was admittedly applied ten days to two weeks after petal fall. Nevertheless, the jury awarded the plaintiff a verdict of $30,000 after it heard testimony that as a result of injury to his trees, his 1949 crop of apples was a commercial failure and the crop was also seriously affected the following year. This verdict was set aside by the trial judge who held that the evidence in the case indicated that the label contained directions for use which, if they had been followed, would have prevented the injury. In the latest action, this decision of the trial judge has now been reversed, and the plaintiff has again been awarded damages.

The decision of the Court of Appeals, incidentally, was a split decision, with two judges dissenting. The majority decision of the court took the position that the manufacturer of a new economic poison has a duty to warn potential users of "unusual hazard involved in use of its poison." The majority also observed that "The fact that the directions are overlooked or are not meticulously followed does not relieve the manufacturer of the duty to warn of latent dangers common to a class of articles."

In its decision the majority took cognizance, and seemed to lend some weight, to the fact that although the label warned against use of the product after petal fall, that such post-petal fall applications are common practice with many other fungicides. The Appeals Court took the position that, since the jury found that the spray did cause the damage, and since the spray was used in accordance with commonly recognized practice, there was an obligation to put on the label a warning or caution statement to guard against injury which could arise if the material was used contrary to directions but in accordance with commonly recognized practice.

The dissenting justices were in sharp disagreement. They pointed out that "the majority opinion fashions a broad new law of negligence in conflict with that which we have followed for many years . . . one apt to cause embarrassment in the future." The author of the minority opinion characterized the verdict as "contrary to the law and the evidence. I cannot bring myself to assent to a recovery by the plaintiffs where the undisputed evidence shows that they brought the damage upon themselves either through negligence or a willful disobedience of directions and warnings. It having been established that no injury would have been incurred by the plaintiffs had they observed the directions and statements on the label of "TAG" and the accompanying pamphlet, it must logically follow that their default was a proximate cause of the damage."

Lawyers who have been following the progress of the case have found the decision particularly significant because it is the first reported case upon which liability has been premised upon the violation of a statutory duty arising under any of the insecticide acts.

Whether or not Calspray would appeal the case, depended upon its success in getting a review by the Virginia Supreme Court of Appeals, a company spokesman indicated.

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NAC Program Being Planned

In observance of its 20th anniversary, the National Agricultural Chemicals Association is planning an unusual meeting September 9-11, at Spring Lake, N. J.

The program, though not complete as yet, will include a report by president Arthur W. Mohr, Richmond, California and NAC executive secretary, Lea S. Hitchner, Washington, D. C.

Speakers are expected to include an expert on fungicides who will point up some of the more recent advances in this field; and a representative of the U. S. Department of Agriculture who will discuss policies of the Department as related to the agricultural chemical trade.

A panel discussion will be featured on the formulation, packaging, merchandising, legislative problems and other pertinent subjects relating to the marketing of pesticides.

Industry members will be invited to ask questions of NAC staff personnel regarding current problems.

The final session on Friday, September 11, will include an address on merchandising and promotion of agricultural chemicals. An official from the registration section of the Livestock Branch of PMA has been invited to discuss some of the common problems surrounding registration and what steps might be taken to minimize such bottlenecks.

As a special feature of Friday's program, the ex-presidents of the Association have been invited to appear as a panel to discuss past development of the industry and to point out its future prospects.

THE SHIELD
THAT HELPS
PROTECT
PRODUCTION

It's SNP *for* CAL-NITRO
TRADE MARK REG. U.S.PAT. OFF.

Cal-Nitro is again available in the free-flowing, fast-acting, long-lasting form that gave it pre-eminence as "the Perfect Topdresser."

This outstanding nitrogen fertilizer compound contains 20.5% Nitrogen and at least 20% Calcium Oxide equivalent—to supply crops with needed plant food economically.

Cal-Nitro is shipped in 100 lb. bags.

It's SNP *for* **POTASH**

MURIATE: 58%-60% K_2O
SULPHATE: 90%-95% K_2SO_4
From Western Germany

SYNTHETIC NITROGEN PRODUCTS CORPORATION
285 Madison Avenue, New York 17, N. Y.

Here's How to Stop Storage Insects Before They Infest Clean Grain

Weevils and other storage insects CAN be kept out of clean grain in storage – kept out without fumigation, and without toxic hazards to food, feed, seed or people who store, handle or process grain. Pyrenone* Protectants properly applied before the grain goes into storage give protection for an entire storage season with *only one application* – even in open bins, or grain in bags or in flat storage. Because Pyrenone protects clean grain (instead of killing weevils after they are in the grain) you have fewer weevils, dead or alive.

There are three Pyrenone products to fit the needs of the grain trade and of farmers:

1. Pyrenone Grain Protectant, a dry product for use on corn, rice, oats, barley, rye, sorghums and grain of all kinds. Only one pound, properly applied, will protect 10 bushels.

2. Pyrenone Wheat Protectant, a dry powder in a wheat-product carrier, for use on wheat. One pound protects 13 bushels.

3. Pyrenone Seed Protectant (Slurry), a wettable powder for application in slurry seed treating machines for protecting seed stocks or any stored grains.

Pyrenone-treated grain can be used for feed, or can be milled for food purposes, yet Pyrenone gives clean grain the protection which keeps weevils out. Help your farmers keep their grain clean on the farm by selling them Pyrenone Protectants – keep your own stored grain free of insect infestation by using Pyrenone Protectants, dry or slurry, in your own plant.

Order your supply from your jobber today.

Pyrenone*

*Reg. U.S. Pat. Off.

PROTECTANTS

For further information on Pyrenone, write U.S.I., Dept. AC. 120 Broadway, New York 5, N. Y.

Calmonite

AMMONIUM NITRATE-LIME

20.5% NITROGEN

2 FERTILIZERS IN 1
Contains 10.25% quick-acting *nitrate* nitrogen.
Contains 10.25% longer-lasting *ammonia* nitrogen.

GREEN PELLETS READY TO USE
Sized for flow and ease of application in broadcasting, top dressing, side dressing, and irrigation. Non acid-forming.

ECONOMICAL SOURCE OF N
At low cost, Calmonite furnishes Nitrogen in the 2 forms needed by all plants — for rapid, early vigorous growth and sustained development.

SUPPLIES CALCIUM, TOO
Contains 35% to 40% calcium carbonate, secondary plant-food essential to soil productivity and good crop yields.

NOW AVAILABLE, F.O.B.
Regular Atlantic and Gulf ports, in even-weight, 6-ply paper bags with 2 bituminous liners.

LOOK AT CALMONITE!
Write for a sample and for additional information today.

EXCLUSIVE DISTRIBUTORS FOR
RUHR-STICKSTOFF AKTIENGESELLSCHAFT,
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H. J. BAKER & BRO.
600 Fifth Avenue, New York 20, N. Y.
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H. J. BAKER & BRO.

Now **OUR** hat's in the ring!

Thompson-Hayward Announces a Series of Outstanding New . . .

Emulsifiers

for the Pesticide Formulator

Here's what YOU will want to know!

These new Emulsifiers in finished formulations will duplicate in the field the results obtained in the laboratory, because:

T-H Emulsifiers have been developed on the basis of Plant-Produced Concentrates similar to YOURS!

With this announcement, the old-established name of Thompson-Hayward moves into the Emulsifier market. We offer a series of new, high-efficiency products having five demonstrable qualities that make them outstanding in the field.

1. Resistance to hard water. 2. SUPERIOR SPONTANEITY. 3. Controlled stability. 4. Evaluated under use conditions. 5. Laboratory controlled plant operations to afford utmost performance per dollar cost.

These EMULSIFIERS, created to meet unvarying Thompson-Hayward high standards, will cover your needs. Write for Free Technical Bulletin.

THOMPSON-HAYWARD
Chemical Company

KANSAS CITY • NEW ORLEANS • DENVER • OMAHA • CHICAGO • MEMPHIS
DAVENPORT • WICHITA • DALLAS • HOUSTON • ST. LOUIS • DES MOINES • SAN ANTONIO
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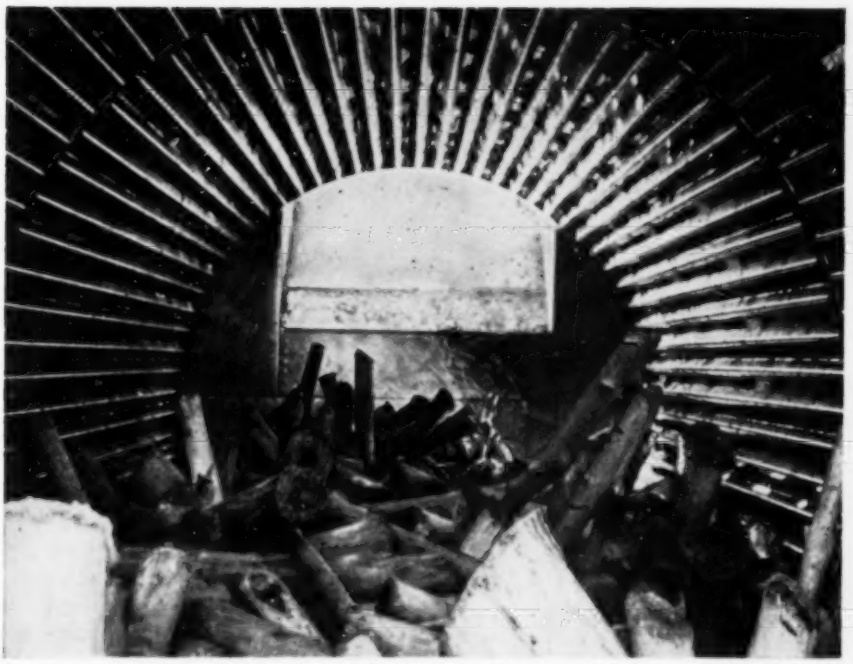
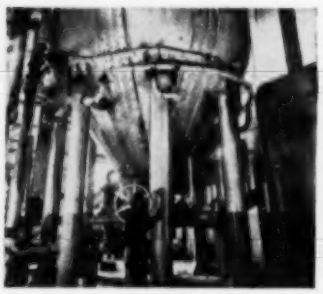


A trip through the barking drums is the first step for this southern pine, on its way to becoming pulp at Hudson's giant Florida Multiwall Sack mill. Logs are tumbled until stripped of all bark.

Wood is next reduced to chips like these. Whirling knives devour a 5-foot log in 10 seconds. The mill consumes 700 cords of pine daily.



Digesters 5-story high cook the chips under pressure in a scalding chemical solution. This reduces the wood to pulp.

Here is why HUDSON can guarantee Multiwall Sacks against breaking on the packer

After the pulp is washed, beaten, and screened, it looks like this. Note long fibers that give added toughness to Hudson Multiwall kraft.

REASON NUMBER 2 HUDSON MAKES ITS OWN PULP

Wood pulp makes up 96 percent of the raw materials for your Multiwall Sacks. By growing its own wood, and manufacturing its own pulp, Hudson exerts iron-clad control of Multiwall Sack quality and delivery schedules. This is another reason why Hudson guarantees to replace *without cost* all Hudson Multiwall Sacks that fail on your packing or closing machines.

HUDSON

MULTIWALL SACKS

the World's most fully GUARANTEED

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SEND TODAY: How to store your sacks for maximum performance

Profusely illustrated folder shows you the scientific way to store your sacks. Step by step procedures that improve the performance of your sacks by up-to-minute storage methods. No obligation.

MAIL THIS COUPON NOW to Hudson Pulp & Paper Corp., Dept 145 505 Park Ave., New York 22, for literature and full information.

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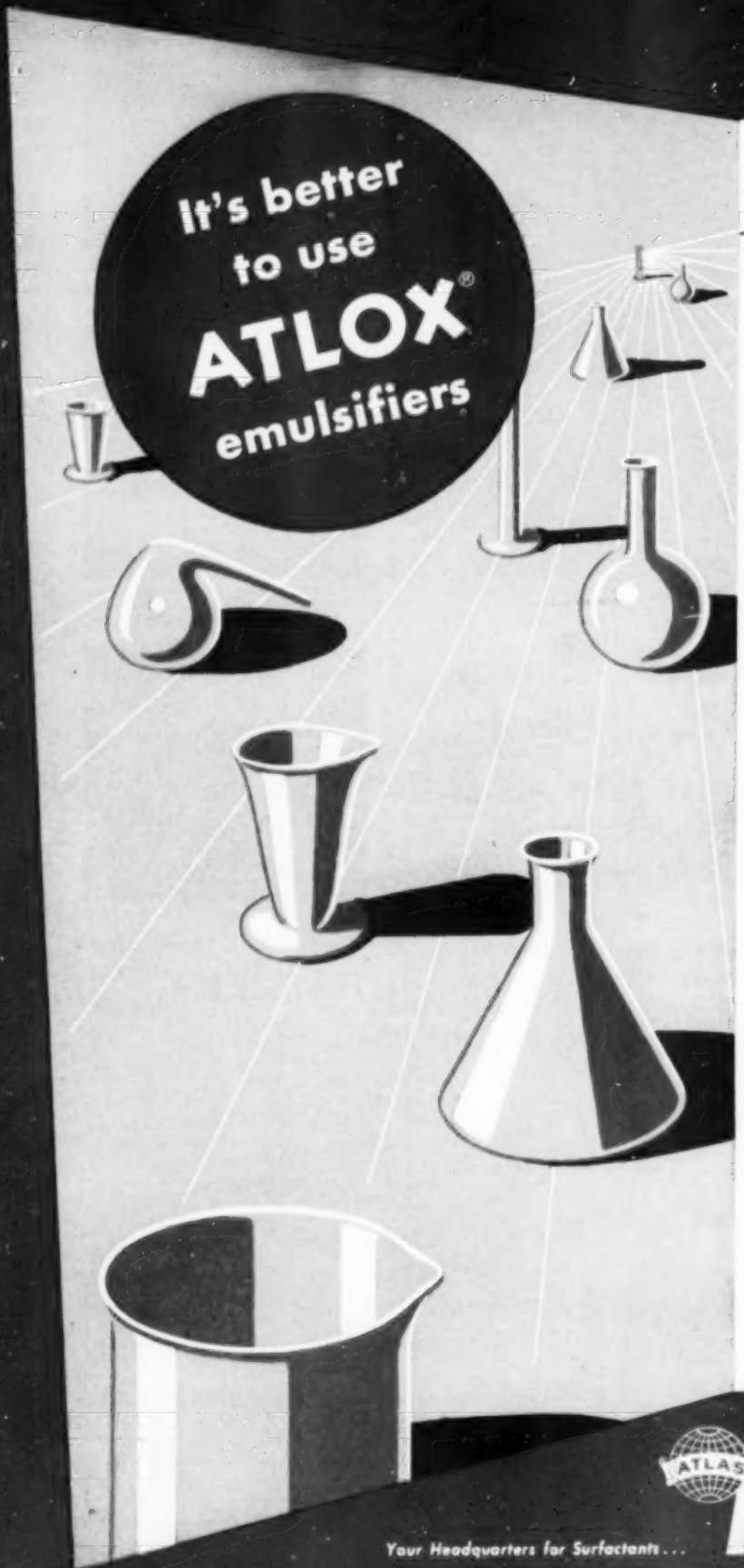

because...

they produce stable concentrates ... economically

Beware of false economy when choosing—and using—emulsifiers! By using the correct Atlox emulsifiers in recommended proportions, you can be sure of mixing concentrates that keep from separating out during low temperature storage . . . have long shelf life . . . and disperse readily in water with little agitation.

You'll find that you get the best results most economically with Atlox emulsifiers. Competitively priced, these products assure you of performance that builds acceptance of the concentrates which you prepare with them.

To assist in your choice of emulsifiers, Atlas offers:

WIDE SELECTION of surface active agents applicable to oil sprays, insecticides, herbicides, wettable powders or insect repellents—for use in high or low-gallonage, knapsack or other equipment.

TECHNICAL SERVICE by Atlas specialists, who help you develop practical formulas for any toxicant . . . any application.

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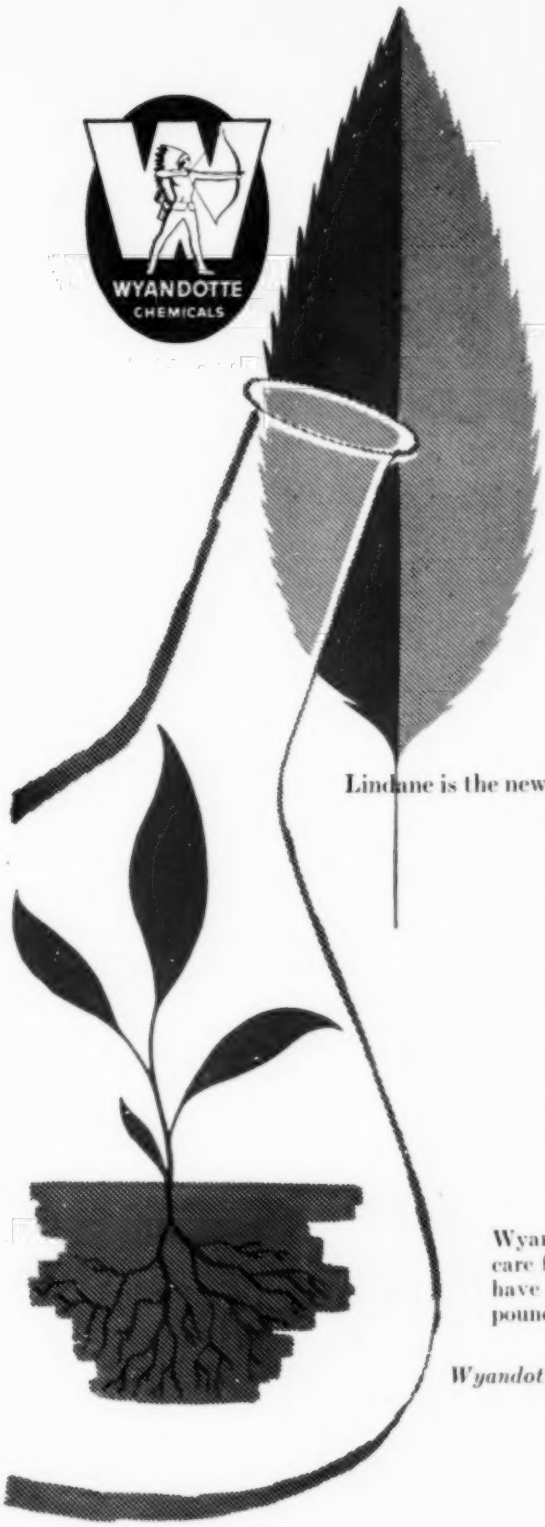
ATLAS POWDER COMPANY, CANADA, LTD.
BRANTFORD, CANADA



lindane

pure gamma isomer of BHC

Now available from Wyandotte in commercial quantities

- safe and easy to handle
- chemically stable **lindane** • free flowing
- readily formulated into solutions or powders

Lindane is the newest addition to Wyandotte's line of agricultural chemicals:

DDT (technical)
BHC (high gamma, low gamma both available)
KREELON* (alkylarylsulfonate for fertilizers)
PLURONICS* (emulsifier)
Wetting agents
Solvents
Fumigants
Emulsifiers
Weed killers
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Wyandotte, with conveniently located warehouses and plants, can care for all your needs in making high quality insecticides. If you have supplier problems, or need technical assistance in compounding, call on Wyandotte.

*REG. U.S. PAT. OFF.

Wyandotte Chemicals Corporation, Dept. ACL, Wyandotte, Michigan
Offices in Principal Cities

Wyandotte CHEMICALS

Soda Ash • Caustic Soda • Bicarbonate of Soda • Chlorine • Calcium Carbonate • Calcium Chloride • Glycols
Chlorinated Solvents • Synthetic Detergents • Agricultural Insecticides • Soil Conditioners • Other Organic and Inorganic Chemicals

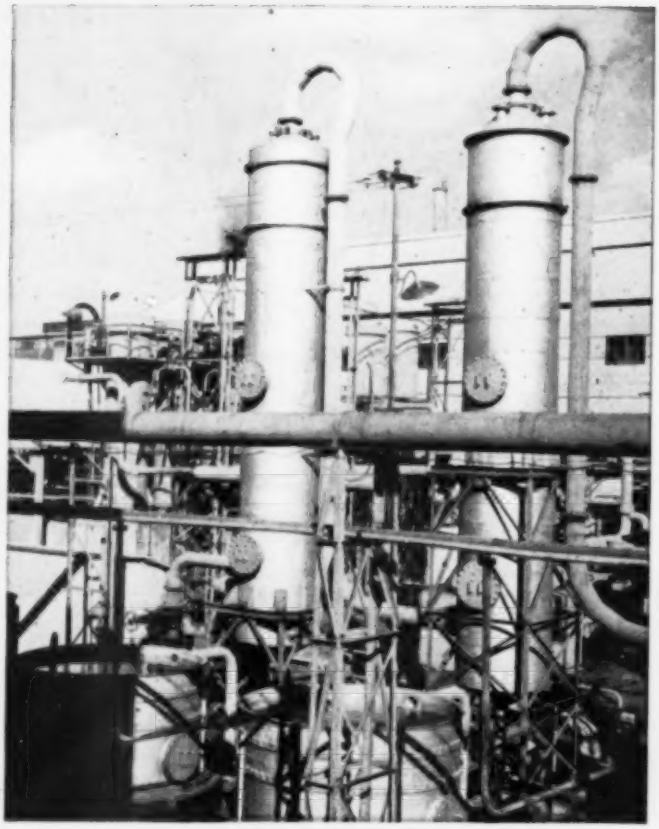
CHEMICO

offers a proven process for the production of

UREA

Chemico's process for the production of Urea is fully proved in actual practice. The overall ammonia efficiency is 97%; conversion of ammonium carbamate to Urea being approximately 76%. The process uses excess ammonia over stoichimetric requirements; the excess being recycled directly without compression.

The market for Urea is large, stable and offers a sound investment opportunity. In the plastics field Urea is the basic ingredient of Urea Formaldehyde Resins. Urea is an ideal fertilizer. It contains 46% Nitrogen. PH is approximately neutral. In the form of 1/16" granules coated with diatomaceous earth, Urea is much less hygroscopic than ammonium nitrate. Nitrogen in Urea is basically cheaper than that available in other solid forms. It is safe to make, ship and handle since it is non-flammable and non-explosive.



This Chemico-built Urea plant of Sumitomo Chemical Co. Ltd. in Niihama, Japan is in full commercial production. Expansion to three times its present capacity is now under way.

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

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Chemico plants are profitable investments

FOR MAXIMUM COVERAGE WITH MINIMUM WASTE USE CONTINENTAL CLAY AS YOUR CARRIER

NEW BULLETIN No. D23 explains how to insure the effect of your high bulk dusts and your wettable concentrates by using CONTINENTAL CLAY as your carrier.

With CONTINENTAL CLAY as your carrier, you can insure the effectiveness of both your high bulk dusts and wettable concentrates.

CONTINENTAL is an economical, top quality clay that gives greater acre coverage. Its unusually fine particle size is only 0.8 micron by air permeation.

WETTABLE CONCENTRATES

CONTINENTAL CLAY wets as readily as any carrier tested in the Vanderbilt Laboratory. Highly compatible, CONTINENTAL is safe to use with all types of toxicants. CONTINENTAL gives finely dispersed suspensions that are completely free from any agglomeration.

HIGH BULK DUSTS

CONTINENTAL CLAY is uniform to assure even distribution of the toxicants. Only 0.75% is retained on a 200 mesh screen. Its compatibility insures full effectiveness of the toxicant. Its high bulk gives increased absorptiveness and excellent flowability to finished dusts.

Don't gamble when formulating dusts and sprays. Write today for the latest technical data on CONTINENTAL CLAY.

R. T. VANDERBILT CO.

SPECIALTIES DEPARTMENT

230 PARK AVENUE **NEW YORK 17, N. Y.**

☐ Please send bulletin No. D23.

☐ Please send sample of CONTINENTAL CLAY.

NAME _____

POSITION _____

(Please attach to, or write on, your company letterhead)

Junior's doing well

New nitric acid plants at Sheffield, Alabama

Junior's in the foreground—a 2 line nitric acid plant, brought into the world in 1952 by C & I. Sitting pot-bellied in the background is the old man—a 12 line plant dating back to 1917.

Here's the story: The new plant per ton costs 1/2 as much, occupies 1/12 the space, has 2 times the capacity per unit and uses 1/3 the man power.

Engineering stories like this explain why C & I is the nation's number one builder of nitric acid plants. With its experience in engineering, design, and construction, C & I will deliver your plant at a FIXED COST on a FIXED DATE. C & I builds Nitric Acid, Neutralizer, Ammonium Nitrate and Complex Fertilizer plants.

A complete plant with or without erection price and performance guaranteed

Specialists in the processing of Anhydrous Ammonia . . .

....and so is his adopted brother

C & I's P. E. C.* PELLETED COMPLEX FERTILIZER PROCESS

The reactor floor on an operating plant producing up to 500 tons daily.

THROUGH C & I you can now obtain a Complex Fertilizer Plant at a fixed price, with production and performance fully guaranteed.

C & I has eliminated guess work by licensing P. E. C. 's patented process — the proven process that has been producing Complex Fertilizer for the past ten years. THE PROCESS IS IMPORTED — THE ENGINEERING AND EQUIPMENT, AMERICAN.

*Potasse et Engrais Chimique

C&I

PEC

THE CHEMICAL & INDUSTRIAL CORP.

CINCINNATI 26, OHIO

A Choice of Two Defoliants for a more profitable cotton harvest

Penco DE-FOL-ATE*

Penco De-Fol-Ate has been developed by Pennsalt to supply a chlorate-type defoliant which is free of boron. Since DE-FOL-ATE is hygroscopic, it picks up moisture from the atmosphere, making it ideally suited for use under climatic conditions usually prevailing at harvest time.

DE-FOL-ATE goes into solution quickly and easily, saving valuable time and insuring that all of the ingredients are thoroughly dissolved before being applied to the cotton. Because it contains a fire suppressant, DE-FOL-ATE does not present the fire hazard normally associated with chlorate-type defoliants.

DE-FOL-ATE, being a chlorate-type defoliant, is dependable; and since it contains no boron can be used on soils which are already high in boron content. It is available in 100-lb. drums.

Pennsalt ENDOTHAL*

Endothal is a liquid cotton defoliant that causes the cotton plant to shed its leaves earlier and more uniformly. As a result, (1) mature bolls open faster; (2) picking efficiency is increased, both hand and mechanical; (3) fewer pickings are required to clean a field; (4) quality is improved—trash and leaf-stain are reduced; (5) boll rot and insect control are aided.

To the grower this means a saving in time and in labor, as well as better cotton—in short, a more profitable harvest!

Endothal is easy to use, dependable in its action. It mixes easily with water in the spray tank, requires no special equipment. Because it takes effect quickly, rain occurring five or six hours after treatment will not ordinarily interfere with plant response.

Endothal is effective at relatively low-gallon-per-acre rates, and is particularly valuable under certain conditions of plant maturity where defoliants often fail. It is available in handy five-gallon cans and in 54-gallon drums.

TWO SERVICE BULLETINS Handy, helpful, "how-to-do-it" bulletins on these products are yours for the asking. For either or both of them, write the Pennsalt office nearest you. Address: Agricultural Chemicals Department, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.; Bryan, Texas; Montgomery, Alabama; Berkeley and Los Angeles, California; Portland, Oregon; Tacoma, Washington.

*Endothal (disodium 3,6 endoxohexahydrophthalate) and De-Fol-Ate are trade names of Pennsylvania Salt Manufacturing Company. The uses of Endothal as a defoliant and herbicide are covered by one or more of the following U. S. Patents: 2,550,494; 2,576,080; 2,576,081; 2,576,083; other patents pending.

Pennsalt makes a complete line of effective cotton insecticides, both dusts and sprays, including BHC, DDT, Aldrin, Calcium Arsenate, Parathion, Toxaphene, and various combinations of these.

Pennsalt Chemicals

To Manufacturers and Formulators of Oil Solution and Emulsifiable Insecticides:

Du Pont 90% Technical Methoxychlor Oil Concentrate offers

1. **EXCEPTIONALLY LOW TOXICITY HAZARD** to people, warm-blooded animals and plants.
2. **VERSATILITY** for a variety of specialized markets.
3. **HIGH RESIDUAL EFFICIENCY** against a wide variety of insects.

Du Pont 90% Technical Methoxychlor Oil Concentrate, a white, water-insoluble powder, fills the specifications for use in many industrial, household, and agricultural liquid insecticide formulations. This chemical has many applications—in aerosols; space sprays; live-stock sprays; bin, mill and bakery sprays; and others. Write to Du Pont for technical bulletins using the coupon on the right.

DU PONT
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BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

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Wilmington 98, Delaware

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Household
Insect Pests

MULTI-PURPOSE

Diamond Lindane

Livestock

DIAMOND LINDANE can be put to highly effective use in more ways than one. Pest Control Operators find it invaluable in their extermination work . . . cattlemen use this safe, economical insecticide to help keep their livestock healthy . . . farmers use DIAMOND LINDANE to pest-proof wheat, corn, barley, oat and other seeds at planting time.

DIAMOND LINDANE kills three ways—by contact, vapor and stomach action—and it *continues* to kill long after it is applied because of its good residual action. Available to formulators in commercial quantities.

Seed Treatment

DIAMOND ALKALI COMPANY

Organic Chemicals Division

80 Lister Avenue, Newark 5, New Jersey

Plants: Newark, N. J. and Houston, Texas

DIAMOND ALKALI CHEMICALS

Chemicals you live by

How Celite Mineral Fillers make a product free-flowing . . .

Keeping fertilizers "On the run"

REALIZING their product is one that cannot "cake-up" and still survive in a competitive market, leading producers of fertilizer use one of the Celite Mineral Fillers as a standard "anti-caking" ingredient.

The ability of Celite Fillers to keep a product free-flowing results from their high absorption properties and unique diatom structure—properties which make them unusually effective safeguards against caking in deliquescent materials. They are two of the unusual physical characteristics that adapt these diatomaceous silica powders to numerous industrial uses.

THESE CELITE PROPERTIES BENEFIT MANY TYPES OF PRODUCTS

Because of their inertness and great bulk per unit of weight, Celite Mineral Fillers make ideal bulking agents for powders and pastes. Their tiny multi-shaped particles interlace to stiffen and strengthen admixtures. The microscopically small facets of these particles diffuse light so effectively that they can be utilized to impart any desired degree of flatness to a surface film. Their light, porous nature improves suspension, helps prevent segregation. And their porous, thin-walled cellular structure imparts a delicate non-scratching abrasive action.

You may find Celite the "extra something" needed to lift your product above competition. Why not discuss its application to your problem with a Celite engineer? Or write for further information and samples to Johns-Manville, Box 60, New York 16, N. Y. In Canada: 199 Bay St., Toronto, Ont.

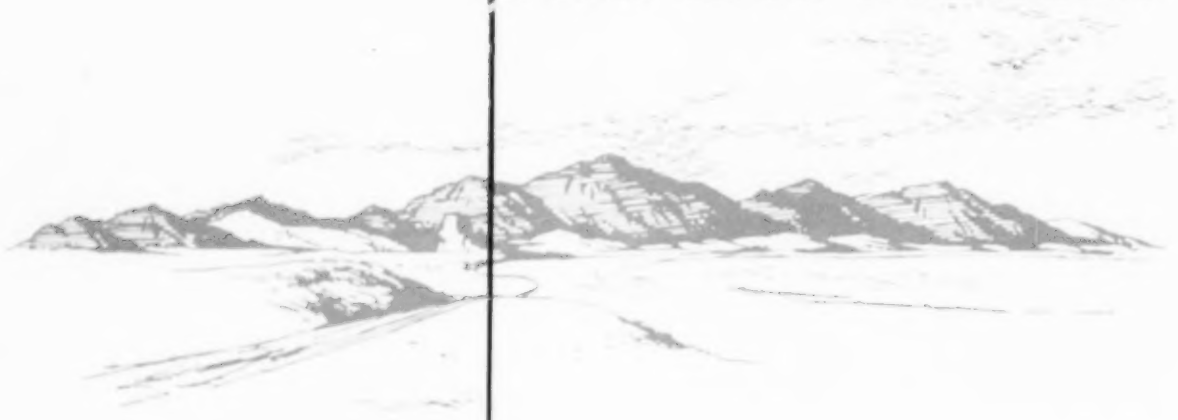
CHECK LIST OF PRODUCT BENEFITS OBTAINABLE AT LITTLE COST WITH CELITE MINERAL FILLERS

- Added Bulk
- Better Suspension
- Faster Cleaning Action
- Greater Absorption
- Improved Color
- Better Dielectric Properties
- More Durable Finish
- Increased Viscosity
- Elimination of Caking
- Higher Melting Point
- Better Dry Mixing
- Improved Dispersion

Johns-Manville CELITE®

MINERAL FILLERS

from arid wastes...



CHEMICALS FOR BUMPER CROPS

The American Potash plant at Trona, in the midst of the California desert area, is situated beside a vast stockpile of raw chemicals essential to agriculture. Under the brand names of *Trona* and *Eston* these chemicals in processed and refined forms, are playing an ever increasing part in growing better and bigger crops. Trona Potash is an essential element in mixed fertilizers. Trona Borax is used to correct soil deficiencies. Eston products include fumigants, defoliants, insecticides and herbicides.

In preparing soil, fertilizing plant growth and protecting it from the attack of destructive insect life, American Potash makes a vital contribution to the greatest industry of all—agriculture.

You can buy Trona-Eston agricultural chemicals with confidence—they are *proved* by many years of research and field usage.

AMERICAN POTASH AGRICULTURAL CHEMICALS

ESTON BRAND		TRONA† BRAND
ALKRON* (parathion formulations)	ESTONOX* (toxaphene formulations)	Muriate of Potash
BROMOFUME* (soil fumigants)	TETRON* (Tetraethyl pyraphosphate formulations)	Sulphate of Potash
ESTOMITE* (residual type miticide)	TUMBLEAF† (defoliants)	Borax, Technical
ESTONATE* (DDT dust concentrates and emulsified solutions)	TUMBLE-WEED† (herbicides)	Sodium Pentaborate
		TRONABOR* Pentahydrate
		Borax (crude)

*Trade Mark Registered †Trade Mark American Potash & Chemical Corp.

TRONA
INDUSTRIAL AND AGRICULTURAL CHEMICALS
ESTON CHEMICALS

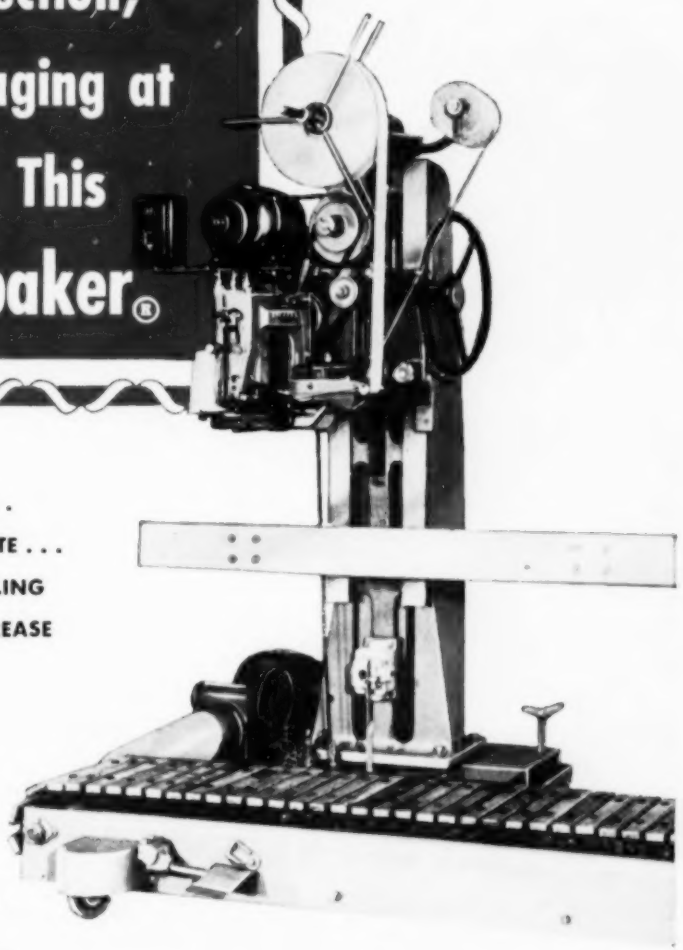
American Potash & Chemical Corporation

Offices 3030 West Sixth Street, Los Angeles 54, California
122 East 42nd Street, New York 17, N. Y.

ESTON CHEMICALS DIVISION
3100 East 26th Street, Los Angeles 23, California

Plants Trona and Los Angeles, California

Get Better Protection, Faster Packaging at Lower Cost With This Model ET Bagpaker®



CLOSES OPEN-MOUTH, MULTIWALL PAPER BAGS SEMI-AUTOMATICALLY . . . TAPES AND SEWS 15 BAGS A MINUTE . . . TEAMS UP WITH YOUR EXISTING FILLING AND WEIGHING EQUIPMENT TO INCREASE PACKAGING EFFICIENCY

You don't have to scrap your present equipment to get *stronger*, more *economical* bag closures with this Model ET Bagpaker. One man—receiving bags from your existing weighing and filling set-up—applies creped "*kraft*" sealing tape over the bag end...sews a reinforced "cushion stitch" through both tape and bag ...and neatly trims tape...time 4 seconds or less. Dimensional drawings and detail information are available in Booklet ET -D-12 Write for your copy *today*. Bagpak Division, International Paper Company, 220 East 42nd St., New York 17, N.Y.,

Model ET applies famous "Cushion-Stitch" over dry tape for sift-proof closure. Model E-1 applies "Cushion-Stitch" only, for use where sift-proofing is not essential.

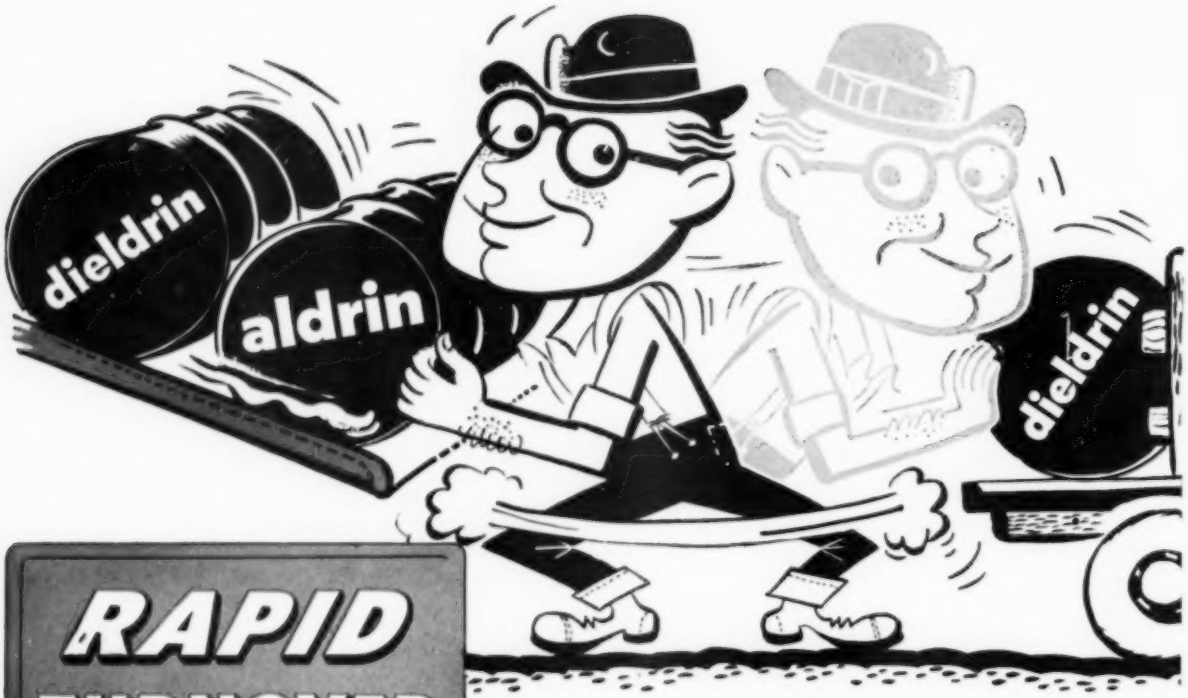
Check These Model ET Bagpaker Advantages

- ★ 15 bags per minute with one operator when filled bags are continuously delivered to conveyor.
- ★ Quickly adjustable for bags of from 25 to 100 lb. capacity.
- ★ Completely portable. Mounted on casters, can be moved easily to various packaging stations.
- ★ Bag starts and stops sewing head when equipped with automatic sewing head control.
- ★ Hoepner No. 150 Heavy Duty sewing unit with automatic brake to prevent "coasting".

International Paper COMPANY

BAGPAK DIVISION

BRANCH OFFICES: Atlanta • Baltimore • Boiler Springs, Kansas • Boston Chicago • Cleveland • Denver • Detroit • Kansas City, Kansas • Los Angeles New Orleans • Philadelphia • Pittsburgh • St. Louis • San Francisco • IN CANADA: The Continental Paper Products, Ltd., Montreal, Ottawa, Toronto



RAPID TURNOVER

Cotton growers demand more and more

...aldrin FOR FAST INSECT KILL

...dieldrin FOR LONG-LASTING ACTION

Aldrin and dieldrin, in use only a few years, have won the acclaim of growers throughout the cotton belt. In the 1952 season these insecticides proved real money makers for formulators. Powerful advertising and highly successful use have put aldrin and dieldrin in the high-turnover, high-profit class.

Aldrin with its fast-killing action and dieldrin with its long residual effectiveness are recommended for control of a wide number of agricultural and public health pests.

Shell offers complete technical service. Technical bulletins are available for detailed instructions on blending and processing, compatibility with other ingredients and the necessary safety precautions to be taken in handling these chemicals.

Send coupon for latest technical information on aldrin and dieldrin.

Aldrin-fertilizer mixture labels accepted by USDA

SHELL CHEMICAL CORPORATION
Julius Hyman & Company Division
P. O. Box 2171, Denver 1, Colorado

Please send me information on aldrin and dieldrin. I am interested in formulating insecticides for control of these pests (please list).

_____

Name_____

Address_____

_____

INDUSTRY News

To New CSC Responsibility

R. W. BREIDENBACH

Commercial Solvents' Corporation's new 20 million nitrogen plant at Sterlington, La., will be completed and in production for the 1953-54 fertilizer year, the corporation has announced. The new facilities, part of the firm's present installation at Sterlington, will double the company's present uotput of nitrogen for agricultural and industrial use. In addition to increasing present output of anhydrous ammonia, the new production units will add two basic sources of nitrogen to the company's agricultural chemical line. These are "Dixsol" nitrogen solutions for mixing fertilizers and crystalline ammonium nitrate for direct application.

R. W. Breidenbach, manager of CSC's San Francisco district office, has been named assistant to Clyde Marshall, general manager of the Agricultural Chemicals Division. In making this announcement, Mr. Marshall stated that Mr. Breidenbach will direct the development of distribution for the increased production volume from the new facilities.

Prior to joining Commercial Solvents in 1948, Mr. Breidenbach was director of research for the Standard Vanilla Corporation and a chemical research engineer for the Lockheed Aircraft Corporation.

The new Commercial Solvents facilities are the first of the chemical industry's privately financed nitrogen expansion programs aimed at a 70 per cent increase in production.

•

S. B. Penick Dies May 24

S. B. Penick, 71, founder of the New York company which bears his name, died at Montclair, N. J., May 24. Mr. Penick was chairman of the board of directors and a former president of S. B. Penick & Co.

The Penick firm imports and exports numerous products and manufactures materials for the insecticide trade as well as for the pharmaceutical and cosmetic makers. Penick's sales agents are operating in virtually every country in the world.

Mr. Penick was a native of Culpeper, Va., who, upon becoming an orphan at 13, followed the well-known American path by becoming a delivery boy and working up through the ranks of the drug business until he reached a position where could put into being some of his own ideas. He decided to buy crude drugs and sell them to manufacturers. Later, he opened his own business at Marion, N. C. and expanded it during World War I and beyond, and moving his headquarters to New York.

S. B. PENICK

Today, the company manufactures largely in bulk for the producers of finished products, trades in raw drugs and makes a few finished products. In 1942, Mr. Penick was succeeded as president by his son, S. Barksdale Penick, Jr.

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Oostermeyer to FMC Board

Jan Oostermeyer, retired June 1 as president of Shell Chemical Corp., has been made a director of Food Machinery & Chemical Corp., San Jose, Calif. Paul L. Davies, FMC president, indicated his belief that Mr. Oostermeyer's broad technical knowledge in the chemical field and his executive leadership would make him a valuable member of the FMC board.

Davison Names Three New Officers

FRANK J. GRIFFIN FRANK Z. OLES WM. B. McCLOSKEY

William B. McCloskey, controller of The Davison Chemical Corporation since 1946, was elected a vice-president of the corporation at a recent meeting of the board of directors, it was announced by R. L. Hockley, Davison president.

Mr. McCloskey, a native of Maryland and a graduate of Baltimore Pace Institute, joined Davison in 1930 after having been associated with the National Fertilizer Association from 1927 to 1930.

The elections of Frank J. Griffin as controller and Frank Z. Oles as assistant controller, have also been announced by Davison.

Mr. Griffin was graduated from Pace College, New York, when he was engaged in public accounting practice from 1935 to 1941. He joined Davison as assistant controller in 1946.

Mr. Oles graduated from Baltimore Polytechnic Institute and the Baltimore College of Commerce and attended Johns Hopkins University. He joined Davison in 1935 and has served as staff accountant and director of budgets and reports.

USDA Honors Dr. Bishopp

Dr. Fred C. Bishopp, Assistant Chief of the Bureau of Entomology and Plant Quarantine, Washington, D. C., was one of seven U.S. Department of Agriculture scientists to receive Distinguished Service Awards on May 18. The presentations were made by Secretary Benson, following an address by Sen. George D. Aiken, Vermont, Chairman of the Senate Agriculture and Forestry Committee.

In addition to Dr. Bishopp, awards were made to Dr. Sterling B. Hendricks, chemist, Bureau of Plant Industry, Soils and Agricultural Engineering, Beltsville, Md.; Dr. Allene R. Jeanes, chemist, Bureau of Agricultural and Industrial Chemistry, Peoria, Ill.; Dr. Henry A. Jones, horticulturist, Bureau of Plant Industry, Soils and Agricultural Engineering, Beltsville, Md.

Joseph M. Mehl, administrator, Commodity Exchange Authority, Washington, D. C.; Ernest Ralph Sasscer, leader of the division of plant quarantines, Bureau of Entomology and Plant Quarantine, Washington, D. C.; and Dr. R. W. Trullinger, chief, Office of Experiment Stations, Washington, D. C.

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1953 Cotton Recommendations

Cotton insect control recommendations for 1953 have been issued by the National Cotton Council of America, Memphis, Tenn. These recommendations cover the 14-state cotton-growing area extending across the entire southern part of the U. S. from North Carolina to California.

Materials included in the recommendations are aldrin, "Aramite", BHC, calcium arsenate, chlordane, DDT, dieldrin, endrin, EPN, heptachlor, methyl parathion, nicotine, "Ovotran", parathion, sulfur, "Systox", TEPP and toxaphene.

The book contains the control recommendations, state by state, laid out in table form with headings of the insect to be controlled and controls by dust and sprays. Pounds of mixture per acre and pounds of technical material per acre are listed, as are means of application.

States covered in the recommendations are: Alabama, Arizona, Arkansas, California, Georgia, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, Tennessee, South Carolina, and Texas.

Copies of the booklet are priced at 15¢ each, the actual printing cost. Write to National Cotton Council of America, Post Office box 18, Memphis 1, Tennessee.

•

Shell Consolidates Research

All future agricultural research activities conducted by Shell companies in the U. S. will be consolidated under the newly-organized agricultural research division of Shell Development Company with headquarters in Denver, Colorado. This announcement was made May 20 by Harold Gershinowitz, president. The newly created division will be responsible for the development and testing of chemical products for use in agriculture.

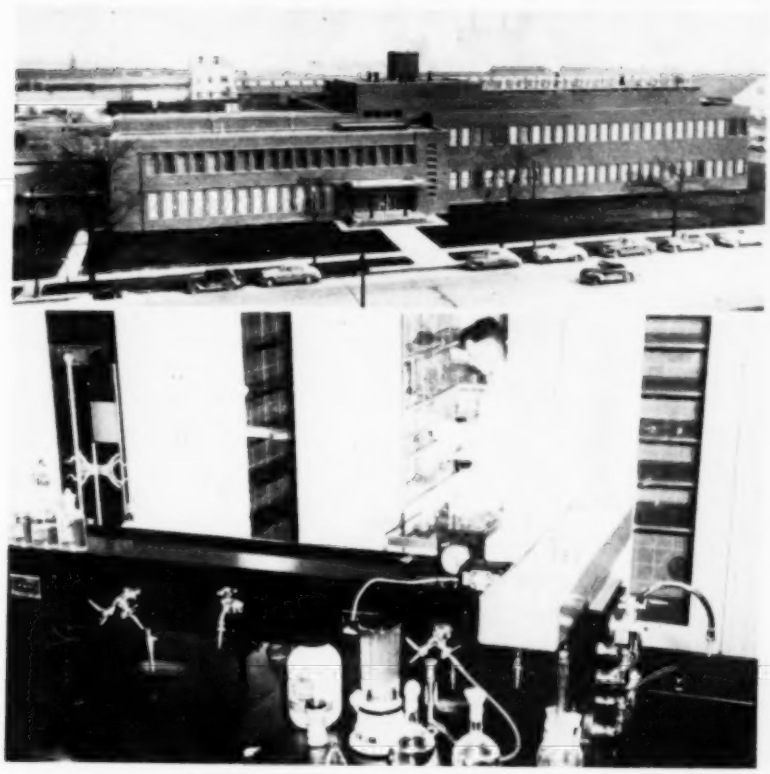
Key executives of the new division are Dr. D. L. Yabroff, Director, Dr. K. E. Marple and Dr. T. R. Hansberry. This consolidation makes possible close coordination between the agricultural research division and the product development activities of the Julius Hyman & Company Division of Shell Chemical Corporation.

In addition to the agricultural research laboratories at Denver, Shell Development also operates a laboratory and experimental farm at Modesto, California, where the company has been active in the study and development of fertilizers, insecticides, nematocides and fungicides. The modesto installation now becomes a part of the newly organized division.

Dr. Yabroff formerly was at Shell Development's laboratory, Emeryville, California, where he was first employed as a research chemist in 1934. He is a native of Kansas.

Dr. Marple, also formerly at Emeryville, now is at the Denver Laboratory of Shell Development. A native of Pomeroy, Iowa, Dr. Marple joined Shell in 1935.

Wyandotte Opens New Research Laboratory



WYANDOTTE Chemicals Corp., Wyandotte, Mich., opened its new research laboratories on June 7th, with an open house and talks by company officials. Robert B. Semple, president, said that the new research center marks the completion of an expansion program started by the company some three years ago. "Because of our experience with research in the past and our need for it now and in the future, we believed that we should put a part of our expansion dollars into . . . research", he told the group.

It was pointed out that provision has been made for a large part of the company's experimental activities. "In addition to fundamental scientific research and development of new and improved products and processes, these include experimental work on large-scale production equipment, construction of equipment to make new products, the testing of products and assembly and correlation of scientific information."

Also appearing on the program on June 7, was Thomas H. Vaughn, vice-president in charge of research and development, who described the functions of the new laboratory.

Physically, the new research building is 172 feet long and 322 feet wide. Administration offices are on the first floor, as is a meeting room seating 150. The second floor houses the market development department, and the scientific library and reading room. The entire building was constructed with an eye to maximum flexibility to allow for future needs.

In the photos are seen (above) the new building in Wyandotte, Mich. The small wing of the laboratory houses the meeting room, administrative offices, scientific library and reading room, the patent attorneys office, and the Market Development Department. The two large wings contain research laboratories.

Within the building are special areas assigned to research in such fields as radioactive tracers, electronics, organic and inorganic chemistry. The building, in the form of a modified "T" extends 322 feet along the street with a central wing extending back 176 feet and has a floor area of 76,000 square feet.

Photo below: Bacteriological laboratory of new laboratory. In addition to a special innoculation room are three walk-in incubators thermostatically controlled to duplicate to the climatic conditions found in many parts of the world.

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Acetic Acid Esters Tested

Preliminary tests on some 85 esters of acetic acid as insecticides are reported in a Bureau of Entomology and Plant Quarantine bulletin, E-859, dated May, 1953. The tests were made in the Bureau's laboratory at Anaheim, Calif.

All compounds were tested against three or more species of insects and one spider mite. The following species were used:

Alder flea beetle (*Altica ambiens* (Lec.)); Armyworm (*Pseudaletia unipuncta* (Haw.)); Celery leaf tier (*Phlyctaenia rubigalis* (Guen.)); Citrus red mite (*Paratetranychus citri* (McG.)); Large milkweed bug (*Oncopeltus fasciatus* (Dall.)); Pea aphid (*Macrosiphum pisi* (Harris)); and Two-spotted spider mite *Tetranychus bimaculatus* Harvey).

The compounds were acetic acid esters of phenols, of compounds having a phenolic group besides other significant groups, or of aromatic or cycloaliphatic alcohols. The samples were prepared at the Beltsville, Md., laboratory, either as 10% dusts in pyrophyllite or as pure materials.

According to the results, the most promising materials found, on the basis of the greatest number of species killed, are 2,3,4,6-tetrachlorophenyl acetate and 2,4-dichlorophenyl acetate.

Comprehensive tables covering the entire series of tests are presented in the U.S.D.A. bulletin. Authors are G. T. Bottger, A. P. Yerington and S. I. Gertler, all of the Bureau's Division of Insecticide Investigations.

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"Ohioized" Steel Drums—the drum with the new car finish

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WARREN, OHIO

OFFICES IN PRINCIPAL CITIES

NBBB Outlines "Acceptable" Selling Statements for

Liquid Fertilizer Advertising

WITH more and more fertilizer manufacturers eyeing the liquid fertilizer field and toying with the idea of entering it some day, it might be of interest to note what the National Better Business Bureau, Inc., has to say about advertising in this field.

In order to be of assistance to advertisers, agencies and media, the NBBB has made a study of the nature and reported performance of liquid fertilizers, particularly those featuring trace elements and sequestering or chelating agents. Its bulletin summarizes information obtained to date.

Although only a beginning in a relatively new field in which authorities are not yet in complete agreement, the NBBB's observations on the subject are submitted by AGRICULTURAL CHEMICALS for whatever they may be worth. It is the feeling of this magazine that this treatment is not the final answer to a complicated problem, but it should certainly serve as a starting point.

Formulas

FOR several years liquid fertilizer formulas (such as 15-30-15) have been advertised with increasing popularity. Diluted properly, a 15-30-15 soluble fertilizer has the same value as 5-10-5, the standard dry fertilizer for so many home garden crops. Advertising should not capitalize on the higher numerals in the formula deceptively to make uninformed persons believe that it is "super-powerful," "highly concentrated," etc. When properly cut with water, it is merely equivalent to the standard dry commercial fertilizer 5-10-5. State fertilizer laws are almost uniform in demanding that labels disclose proper rates of dilution, for otherwise uninformed gardeners would either burn their plants or fail to give them sufficient fertilizer. Obviously, advertising claims based upon the number of gallons of "plant food" in a liquid fertilizer formula should conform strictly to the rate of "cutting" or dilution set forth in the labeling so as to avoid deceptive exaggeration of the fertilizer value of the product.

(A 100 lb. package of water soluble 15-30-15 fertilizer contains three times as much nitrogen, phosphorus and potash, as a 5-10-5 formula, but must be properly diluted in water before application. While it is 3 times more potent as packaged, this potency does not extend to greater potency in plant production. Both dry and liquid fertilizers give about equal results when equal amounts of plant nutrients are applied.)

In addition to the 3 major elements, there are 12 others which plants require for nutrients. Three (carbon-hydrogen-oxygen) are obtained from air and water. Three more (calcium-magnesium-sulphur), known as the secondary group, come usually as lime and its substitutes and superphosphates, and are in nearly all fertilizers. The amounts of these elements found in standard commercial fertilizers depend upon the materials used in formulating the mixture. Usually, smaller amounts are found in the more highly concentrated mixtures. In the manufacture of liquid fertilizers, water soluble materials are necessary, so such fertilizers frequently contain smaller quantities of the secondary elements than do regular dry fertilizers, unless they are specifically added.

Trace Elements

THE trace elements (boron-copper-iron-manganese-molybdenum-zinc) do not usually come in fertilizers in appreciable amounts unless they are specifically added. In fact, special applications are not recommended unless need for them is known. They can do more harm than good in some cases. Some of the minor elements can easily be used in toxic amounts because only small quantities are required, and reliable manufacturers are very cautious in their formulations. NBBB believes that advertisers should avoid claiming or implying that trace elements should be added to the soil in any given area unless such is the fact.

Trace elements are very beneficial when applied to soil where a deficiency exists. In some areas, where known deficiency exists, special addition of trace elements is of vital importance. Some advertisers, emphasizing the need of plants for these trace elements to prevent "starving," have misleadingly implied special competitive advantage from inclusion of trace elements in their products. NBBB has been advised that most fertilizers contain equal or greater

MONTANSALPETER

AMMONIUM SULPHATE NITRATE

26% NITROGEN

supplies the 2 key forms of nitrogen

Contains 6½% nitrate nitrogen — quick acting for early, vigorous growth. Contains 19½% ammonia nitrogen — slower acting for sustained growth through to harvest time.

easy to use

Pelletized and properly sized for flow. Easy to handle, ready to use for top dressing, side dressing and irrigation.

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Savannah Bank & Trust Co. Bldg., Savannah, Ga.
Stovall's Professional Bldg., Tampa, Fla.

quantities of trace elements than these advertisers list on their labels. Advertisers should not claim or imply that their product alone contains trace elements, or that it contains greater quantities of such elements than competitive fertilizers when such is not a fact.

Sequestering Agents

IN some cases, plants will be lacking in certain minor elements because the elements are not available. Chemists have found that EDTA (Ethelene diamine tetracetic acid) will solubilize iron, make it available to plants where there is an iron chlorosis, or deficiency. It is also said that similar experiments are proving that copper, manganese and zinc can similarly be made available. It is possible that where deficiencies *are* present, the presence of such agents will be of great help but such deficiencies are relatively rare. Advertising should not exaggerate the likelihood of plants "starving" from lack of minor elements. They starve or prosper, generally, from proper amounts or balance of the 3 main elements — plus, of course, sun, water and care.

Foliar Application

INTEREST in foliar application of nutrients to commercial crops has increased greatly. It has been found that some plants benefit by spraying or sprinkling fertilizer solution on the leaves, as well as by normal application at the roots, but such response varies greatly, plant to plant. Pineapples, for instance, really benefit from it, but it won't mean much to the average gardener, because most of his plants do well with normal application of fertilizer to roots. However, because rain washes any application to the roots, none of the spray is lost, regardless of whether the plant is subject to the faster foliar absorption or not. In any event, speed does not mean as much to the plant's normal utilization of fertilizers as some advertising has implied. (See next paragraph.)

Radioactive Isotope Use

THERE has been much misunderstanding of "atomic tests" and the use of radioactive isotopes to illustrate speed of absorption of liquid fertilizers. Certain Rutgers University photographs have been generally used to present dramatically the speed with which liquid fertilizers, in a matter of minutes, penetrate to the tips of plants. (The University has asked all advertisers to refrain from using its name when those photographs are used.) Some people actually ask about "That radioactive plant food." A trace of radioactive material was added to the fertilizers in the experiments for the sole purpose of enabling the experimenters to "photograph" the rate of absorption and translocation to different parts of the plant. This was done by pressing the leaves against radio sensitive plates to photograph the rate of progress. Obviously, the radioactive isotopes do not come with products on the market and advertising should contain no claims as implications to the contrary. Liquid fertilizers *are* rapidly absorbed, but at the same time, it is questionable if, under most conditions, that is a virtue. Advertising should not disparage the slower feeding rates of "ordinary" fertilizers or paint a picture of inadequacy in such alleged sloth. There are advantages to rapid absorption of a fertilizer, but these are special cases.

Hydroponics

ADVERTISING should not confuse results obtained in growing plants in tanks of pure sand with liquid fertilizers with results which may reasonably be expected under normal gardening conditions. In the greenhouse, with careful feeding of exact amounts of all elements required by each species of plant, amazing things have been done. This method has also been used commercially, but that is a specialized field. References to such experiments should not give the impression that any one formula will give similar results with all plants in any kind of soil with no more than the customary care of the home gardener.

Vitamins and Hormones

PLANTS manufacture their own vitamins, and experts say that advertising which claims inclusion of vitamins in fertilizer formulas is definitely misleading. Hormones have no proven beneficial effects when applied to soils alone or with fertilizers. Such materials may cause earlier and more abundant growth on cuttings, but plant scientists look askance at root hormone claims in packaged fertilizers.

Conclusions

LIQUID fertilizers have their advantages which can be properly advertised, but they will not displace dry fertilizers, which have other advantages, especially in providing nitrogen over a period of time.

Where fertilizer elements can be used by above-ground parts of plants, the water soluble fertilizer is an economical, conveniently handled form but must be applied with great caution. When properly applied, it has advantages for the small gardener. Benefit will be achieved even if it does no more than increase the home gardener's watering of his growing things in order to apply the fertilizer. However, advertising should exercise care to avoid exaggeration of benefits to be received from factors of minor importance to the home gardener.★★

S. O. Entomologist Dies

Clarence R. Cleveland, 63, chief entomologist in the sales technical service department of Standard Oil Company (Indiana), died suddenly May 14.

Mr. Cleveland was in charge of development and technical service of insecticide, herbicide and fungicide products for Standard Oil, where he had worked since 1927.

He held a B.A. degree from the University of Wisconsin where he majored in economic entomology. He served as conservation officer and lecturer for the Wisconsin Conservation Department, was assistant entomologist and assistant professor of economic entomology at the University of New Hampshire, and later became assistant research entomologist for the Purdue university agricultural experiment station and assistant professor of entomology.

Mr. Cleveland was the author of many research and technical articles in scientific and trade journals.

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TYPICAL INSTALLATION SHOWING BRADLEY PNEUMATIC HERCULES MILL SET ON FOUNDATION AT FLOOR LEVEL, PROVIDING ACCESSIBILITY TO ALL MECHANICAL PARTS.

The Famous

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and other materials where a uniform, finely ground product is required.

BRADLEY HERCULES MILLS, which have been so well accepted by the world's largest Portland Cement and Agricultural Limestone plants as standard grinding equipment, are now available for grinding Phosphate Rock to any desired fineness for acidulation and direct application.

The only pneumatic type roller mill installed at floor level, allowing for great accessibility, being equipped with a large walk-in type door for inspection or maintenance. Mill is so designed that the grinding ring and rollers can be replaced without dismantling mill or disturbing air system.

The **BRADLEY PNEUMATIC HERCULES MILL** is equipped with a modern electrically controlled vibrating type feeder, insuring positive feed and allowing the mill to operate at its greatest efficiency. This type of feeder is a special feature of Bradley roller mills, being non-clogging, durable, efficient and simple to operate and maintain.

Hundreds of Bradley Mills are successfully used in all parts of the world by many industries for the production of finished materials ranging from 20 to 325 mesh.

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SPECIALISTS in the MANUFACTURING OF PULVERIZING MACHINERY SINCE 1891

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NEWS

Brevities

THE DEL-MAR-VA PENINSULA FERTILIZER Association will hold its annual meeting on Saturday, June 27th at the George Washington Hotel, Ocean City, Md., according to Otis McAllister, Cambridge, Md., secretary of the group. Program plans had not been announced at press time but a large crowd is expected to be present on June 27th.

•

ATLAS POWDER CO., Wilmington, Del., has named Ralph K. Gottshall president and chairman of the executive committee of the company. He succeeds Isaac Fogg in both positions. Mr. Fogg has retired but will become chairman of the board of directors. The new president joined Atlas in 1927, following his graduation from Lafayette college. Mr. Fogg has been with the firm since 1913.

•

LION OIL COMPANY re-elected its entire board of directors at its recent annual meeting in El Dorado, Arkansas. T. H. Barton is board chairman and T. M. Martin, president. Mr. Martin reported that the firm's expansion program, begun in 1952, represents the greatest construction program for manufacturing in the company's history. Included in the expansion will be a 53% increase in nitrogen production.

•

DAVEY TREE EXPERT COMPANY is building a new technical service center at Kent, Ohio. It will replace the old Davey Institute of Tree Service building and is said to be the only privately-owned center in the area devoted exclusively to arbiculture. Homer L. Jacobs will be in charge of the center which is expected to be ready for use on September 1.

•

WILLIAM C. LOVEJOY, credit manager of the Fulton Bag & Cotton Mills, Atlanta, retired May 10 on his 33rd anniversary with the company. He is succeeded by Wylie K. White, formerly assistant credit manager. A native of Grantville who spent his boyhood in Newman, Georgia, Mr. Lovejoy became credit manager for Fulton Bag in 1920.

•

ARTHUR L. ROSS, ASSISTANT GENERAL MANAGER, Southern Kraft Division, has been elected a vice-president of International Paper Company, according to John H. Hinman, president. A veteran of 28 years with the company, Mr. Ross was appointed assistant general manager of the Southern Kraft Division last August after having served since 1939 as production manager of the company's nine integrated pulp and paper mills in the south.

THE EIGHTH NATIONAL MEETING of the Armed Forces Chemical Association was held at the Waldorf-Astoria Hotel, New York, May 20 & 21. Major General Wm. N. Porter, former chief chemical officer of the army and now chairman of the board of Chemical Construction Corporation, is president of the New York chapter of the Armed Forces Chemical Association. Representatives of E. I. duPont de Nemours & Co., Inc.; American Cyanamid Co.; and Johns Hopkins University appeared on the program as speakers.

•

BEMIS BRO. BAG COMPANY has appointed George E. Dean as sales manager of its Kansas City sales division. He has been with the company since 1942 and has had wide experience in the milling industry. Before his recent appointment, Mr. Dean was a Bemis salesman in the Kansas City area.

•

HOWARD M. PARSHLEY, 68, professor emeritus of zoology at Smith College and a well-known entomologist, died May 19 at Northampton, Mass. He was author of numerous scientific articles and books, including "The General Catalogue of the Hemiptera". He was a member of the Entomological Society of America and other scientific societies. He was at Smith from 1917 until his retirement a short time ago.

•

THE ANNUAL MEETING of the Air Pollution Control Association was held at the Lord Baltimore Hotel, Baltimore, Md. on May 25 to 28. Subjects for discussion included problems faced by chemical fertilizer plants and steps necessary to correct air pollution. The large crowd in attendance included numerous representatives of the fertilizer industry.

•

THREE MEN HAVE BEEN NAMED to posts at American Cyanamid Company's plant now under construction near New Orleans, Louisiana, G. J. Forney, plant manager has announced. They are: J. J. O'Leary, general production superintendent; David V. Acaster, acetylene department superintendent; and Gilbert J. Kenngott, acrylonitrile department superintendent.

Mr. O'Leary came to Cyanamid from Allied Chemical and Dye Corporation. From 1934 to 1940 he was Production Manager of Allied's Hopewell, Va. plant. As regional manager, he directed the operations of the Ohio River and Buckeye Ordnance Works during War II. Messrs. Acaster and Kenngott joined Cyanamid in 1944 and 1943, respectively.

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LION NITROGEN FERTILIZER SOLUTIONS—For formulation. Three types to suit varying weather and manufacturing conditions.

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TECHNICAL SERVICE—Lion provides special technical assistance for fertilizer manufacturers. Write to CHEMICAL SALES DIVISION for quick service.

LION OIL COMPANY

EL DORADO, ARKANSAS

LISTENING *Post*

Control of Summer Diseases on Sensitive Apples

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

PLANT pathologists at the Purdue University Agricultural Experiment Station report that during the past few years several hitherto unimportant diseases have caused concern to commercial apple growers in southern Indiana. The apparent increase in incidence of summer diseases such as black pox (*Helminthosporium papulosum*), black rot (*Physalospora obtusa*), sooty blotch (*Gloeodes pomigena*), and Botryosphaeria rot (*Botryosphaeria ribis*) has necessitated reconsideration of fungicidal materials for summer schedules, particularly for varieties susceptible to damage to the finish of the fruit.

G. D. Lewis and J. R. Shay report results of 1952 experiments with summer fungicide schedules. In this year for the first time, fair success was obtained in controlling these diseases on Golden Delicious without adverse effects on fruit finish.

Black pox has become well-established in a young bearing orchard in Brown County, under good management but planted on an old orchard site. In this orchard, 12- to 16-year old Gallia Beauty trees are in various stages of decline from pox lesions on twigs and scaffold branches. This variety appears to be particularly susceptible to wood infections.

Several trees of another Rome stram, an attractive striped red sport, appear to be resistant to wood infections and are maintaining normal growth. Golden Delicious trees interplanted with the severely infected Gallia bear numerous pox lesions on limbs of all ages but the trees are not so adversely affected in vigor. The fruits of Gallia and Golden Delicious in this orchard have been unmarketable as a result of pox infections under reduced-dosage sulfur spray program.

The standard sulfur dosages, generally used farther north for summer scab protection, are hazardous because of high temperatures. Excellent control of fruit lesions has frequently been obtained by the grower with weak Bordeaux cover sprays, but severe foliage injury occurred on both varieties and the

TABLE 1

Effect of fungicides on disease development and finish on Golden Delicious apples. Nashville, Indiana, 1952.

Treatment[a] Schedule	Number replications	Number fruits examined	Percent of fruits affected by disease or injury			
			Black pox	Russet	Flyspeck	Sooty blotch
Check[b]	4	1757	99.2	56.4	36.8	97.3
Sulfur						
Pink, calyx, 1-5[c]	4	1071	85.9	39.6	0.9	27.7
Ferbam						
Pink, calyx						
Tenn. Copper, 1-6[d]	2	1000	2.8	95.3	0.0	0.0
Captan[e]						
Pink, calyx, 1-8	3	1500	6.5	17.3	0.0	0.0
Pink, calyx, 1-6	4	2000	8.7	33.7	0.0	0.0
Pink, calyx, 1-4	3	1500	16.1	42.3	0.0	0.1
1-6 (omit pink and calyx)	4	2000	20.0	63.4	0.0	0.1
Pink, calyx, 3-6 (omit 1, 2)	3	1500	27.1	39.4	0.3	0.3
Pink, calyx, 1, 2, 5, 6 (omit 3,4)	2	1000	23.3	24.8	0.3	0.1

[a]Dates of application: Pink April 29, calyx May 6, first cover third week of May, second cover June 5, third June 19, fourth July 3, fifth July 17, sixth July 31, seventh August 14, eighth September 2. All plots received Aramite miticide in late June.
[b]No fungicide throughout season; received chlordane and DDT first week of August for apple curculio control.
[c]Pink: liquid lime sulfur 2 qt., Kolofog 3 lb./100 gal.
Calyx: Kolofog 3 lb., wettable sulfur 4 lb., lead arsenate 3 lb., lime 3 lb./100 gal.
First cover: Kolofog 3 lb., wettable sulfur 4 lb., DDT 50% 2 lb./100 gal.
Second and third covers: Kolofog 2 lb., wettable sulfur 2 lb., DDT 50% 2 lb./100 gal.
Fourth and fifth covers: Kolofog 3 lb., DDT 50% 2 lb./100 gal.
[d]Pink: Fermate 2 lb./100 gal.
Calyx: Fermate 2 lb., and lead arsenate, 2 lb./100 gal.
First through sixth cover: Tennessee copper 26, 2 lb., high Mg. lime 2 lb., and DDT 50%, 2 lb./100.
[e]All captan applications in pink and calyx were at rate of 2 lb. of 50% wettable powder /100 gal. Lead arsenate 2 lb./100 gal. added in calyx. All captan cover sprays were at rate of 1 lb. of 50% wettable powder plus 2 lb. DDT 50% /100 gal.

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PRODUCTS:

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Sulphate of Ammonia—21% N
Calcium Nitrate—15.5% N
Nitrogenous Tankage—10/11% NH_3
Urea—45% N

Triple Superphosphate—46% A.P.A.
Di-Calcium Phosphate—30/32% A.P.A.

Muriate of Potash—60% K_2O

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Golden Delicious fruits were unmarketable owing to severe russet.

Preliminary trials in 1951 in which "341," "Dithane D-14" + ferric sulfate, "Manzate," and wettable sulfur, were applied in four cover sprays indicated that none of the materials were effective in the schedule used.

More extensive trials were conducted on Golden Delicious in 1952, comparing captan (formerly "SR 406") in the form of "Orthocide 406" with "Tennessee Copper 26" and sulfur. The data in Table 1 summarize the results of these trials. All materials and schedules gave significant reduction in fruit pox but the captan schedules and the copper treatment were significantly better than sulfur.

Although significant differences were not obtained among all the captan schedules, the data suggest that under the conditions of this test, the pink through fourth cover applications were more important in controlling fruit pox than later applications. All treatments gave good control of fly-speck (*Leptothyrium pomi*) and sooty blotch except sulfur which gave good control of flyspeck but poor control of sooty blotch. The copper sprays induced severe russet. The full season captan schedule resulted in the best finish of any treatment.

It is interesting to note that the omission of captan in the pink and calyx applications resulted in a significantly greater amount of russet than any other captan schedule. The foliage on the captan-sprayed trees was noticeably superior in size and greenness of leaves to any other treatment.

In southwestern Indiana, extensive fruit rotting both before and following harvest in 1950 affected several varieties, particularly Golden Delicious, Rome, Starking, and Stayman. The rotting recurred in even more severe form as harvest approach-

TABLE 2

Effect of fungicides on post harvest rot of Golden Delicious caused by *Botryosphaeria ribis*. Vincennes, Indiana. 1952. (Data obtained in cooperation with Don Hamilton U. S. Bureau of Entomology and Plant Quarantine).

Treatments		Percent fruits rotted after 2 weeks	Percent fruits rotted after 1 month
Orchard No. 1[a]			
13. Captan — DDT	Series 1[b]	0	12
	Series 2	12	16
14. Standard Fungicide—DDT	Series 1	32	84
	Series 2	92	96
15. Crag 341—DDT	Series 1	12	60
	Series 2	64	84
16. Sulfur—Lead Arsenate	Series 1	60	96
	Series 2	84	92
Orchard No. 2			
Grower's schedule[c]	Series 1	68	96
	Series 2	96	100

[a]Treatments 13-16 were U.S.D.A. — B.E.P.Q. plots of Mr. Don Hamilton as follows:
Treatment 13: Captan 50% 2 lb. in calyx and first to third covers, captan 50% 1½ lb. in fourth to sixth covers, captan 50% 1 lb. in seventh cover applied eight/18. All sprays contained 2 lb. DDT, 50% per 100 gal.
Treatment 14: Standard Fungicide ½ pt.; DDT 50%, 2 lb./100 gal. in calyx through seven covers.
Treatment 15: Crag 341 1½ qt., lime 2 oz. in calyx, Crag 341 1 qt., lime 2 oz. in first through seventh covers. All sprays contained 2 lb. DDT, 50% per 100 gal.
Treatment 16: Sulfur 5 lb.; lead arsenate, 3 lb.; lime 3 lb. in calyx and first three covers; Kolofog 2 lb., lead arsenate 3 lb., lime 2 lb. in fourth through seventh covers.
[b]Fruits for both series collected September 24. Fruits in first series were placed at room temperature immediately. Fruits in second series retained in cold storage until October 25, then placed at room temperature.
[c]Postbloom fungicide applications in grower's schedule were Ferbam 1½ lb./100 in calyx, first and second cover; Kolofog 1 lb./100 in third cover.

TABLE 3

Summary of the effect of "captan" on the finish of Golden Delicious and Grimes Golden apples in southern Indiana.

Orchard	Variety	Spray program[a]	Total number fruits examined	Percent of fruit in various russet categories[b] Russet-free	1-10%	11-30%	Over 30%
Purdue (Lafayette)	Golden Delicious	Magnetic "70" sulfur	869	1.9	38.5	57.5	2.3
		Captan 50W (2-100)	944	13.8	65.0	21.2	0.0
Purdue (Bedford)	Grimes Golden	¾-1½-100 bordeaux and ferbam	1268	12.0	31.0	43.0	14.0
		Captan 50W (2-100)	1738	70.0	21.0	9.0	0.0
Clayton	Golden Delicious	Home-wet sulfur	596	0.3	21.9	36.6	28.2
		Captan 50W (1-100)	525	95.2	3.6	0.8	0.2
		Captan (1-100) from first cover spray	435	16.9	64.4	13.3	0.0

[a]All plots received uniform spray treatment up to petal-fall spray. Spray program indicated applied from petal-fall through sixth cover spray.
[b]Categories refer to percentage of fruit surface involved by russet. Russet of all types including enlarged lenticels considered in grading fruit into the various russet categories.

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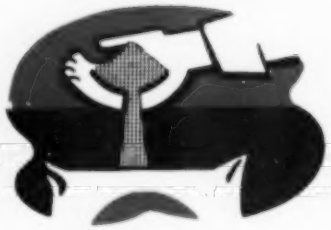

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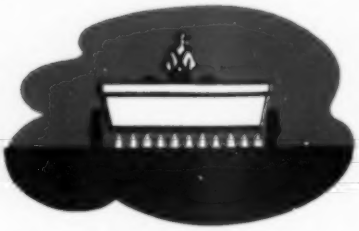

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ed in 1951. Fruits that appeared sound when harvested, rotted rapidly when held at room temperature. In some cases, the fruits rotted after packaging, sale, and delivery, and costly adjustments between grower and distributor had to be made. *Botryosphaeria ribis* was isolated repeatedly from infected fruits in 1951.

Botryosphaeria rot failed to develop in an extensive fungicide trial conducted in a Gallia Beauty orchard at Vincennes in 1952. Fortunately, the disease was present in a nearby orchard in which D. H. Hamilton, entomologist of U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, was conducting fruit finish experiments on Golden Delicious. He kindly allowed us to obtain data from plots in which four fungicides had been used in calyx through seven covers.

The last cover was applied August 18 and the fruits were harvested September 24. Samples of 50

(*Turn to Page* 157)

Pear Psylla is Discovered in California

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is connected with the Division of Insect Detection and Identification, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the United States.

By Kelvin Dorward

PEAR psylla (*Psylla pyricola*) was found for the first time in the State of California, on May 4. Three infestations were found on this date: two in Siskiyou County and one in Del Norte County, adjacent to the Oregon border. This finding had been anticipated by California authorities, since the insect has been moving southward rather rapidly in Oregon. Fortunately, the commercial pear-producing areas of California are partly protected against immediate infestation through a large area of mountainous terrain in which pear is practically non-existent.

Pear psylla has been known in the eastern United States for over one hundred years, but was not found west of the Rocky Mountains until 1939. In addition to the newly-infested area of California, it is known to occur in areas of Idaho, Washington and Oregon.

Boll Weevil Bears Watching

ALTHOUGH the boll weevil was still generally light in the Rio Grande Valley of Texas, by mid-May in some other sections of the cotton belt it showed signs of potential trouble. Emergence from hibernation cages at Waco and College Station, Texas was comparatively large. At Waco, emergence through May 8 had been exceeded in the past 15 years only in 1941, 1944, 1945, 1950, and 1951. By mid-May, adults were showing up in a few North Carolina areas with more weevils expected than in either 1951 or 1952. At Florence, South Carolina, 155 boll weevils were removed from hibernation cages during the week ending May 9 as compared to 60 during the same week of 1952. The first weevil to be found in the field at Florence was found May 11. The first weevil in Bullock County, Georgia, was found May 12. In Washington County, Mississippi, five of 13 fields were found infested with an average of 100 weevils per acre. At Tallaulah, Louisiana, adult survival for the period May 1-14 was 0.28 percent compared to 0.32 percent for the same 1952 period.

Potato Psyllid Build-up

APRIL surveys in the Texas-New Mexico potato psyllid spring breeding area, which is north of the Texas overwintering area, disclosed psyllid populations averaging 29 per 100 sweeps. This is the highest population recorded in any year since observations started in 1945, except for 1947 when the population averaged 65 psyllids per 100 sweeps. In 1949, when a serious outbreak occurred, the population averaged only 18 psyllids per 100 sweeps. The probability of an outbreak in the Colorado-Wyoming-Nebraska potato-growing areas will depend largely on weather conditions in May and early June. Warm weather would favor a movement of the psyllids.

A survey during the second week of May showed that large numbers of psyllids had moved into southern Colorado where they averaged 45 per 100 sweeps. This is regarded as a further indication that 1953 may be another epidemic year.

Tobacco Insects

THE green peach aphid which in recent years has become a serious pest on tobacco was reported to be on the increase in the shade tobacco area of Quincy, Florida during May. Earlier in the month, well established colonies of the insect were reported on sun tobacco in the Gainesville, Florida region with farmers and insecticide dealers stating that the aphid was more numerous on tobacco than during the past few years. This insect, by the middle of May, was infesting tobacco plant beds in Montgomery County, Tennessee for the first time since 1951. Among other insects causing concern on tobacco was the vegetable weevil larvae in middle and east Tennessee and the adults in Horry and Dillon Counties, South Carolina. Wireworms caused unprecendented losses to newly set tobacco plants in Florence County, South Carolina where replanting was necessary in many instances.

Cereal Forage Pests Active

PEA aphid caused heavy damage to alfalfa and clover in several states during May. Early in the month Utah reported 40 percent of 16,000 acres of alfalfa severely damaged in Salt Lake County with an additional 25 to 30 percent showing economic damage. Serious damage was also recorded in Davis, Utah and

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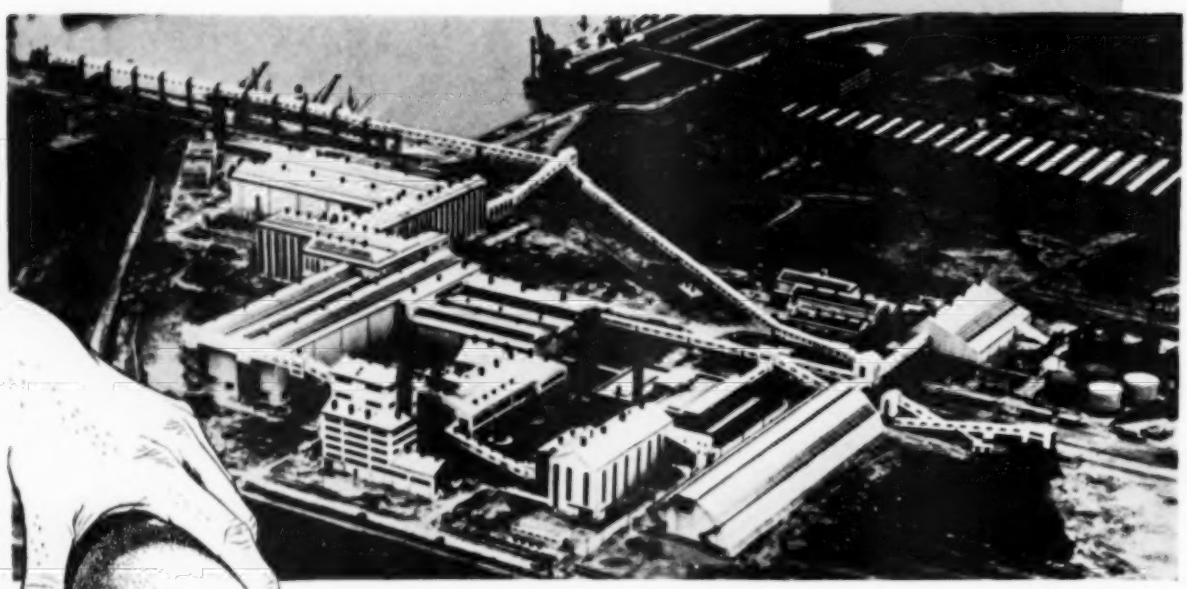

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other counties. About 40 percent of alfalfa and clover fields in Illinois had heavy to severe infestations, stems in many cases were completely covered with the aphids. Moderate to heavy infestations were reported in the remaining 60 percent of the crop.

A heavy fungus attack had reduced this infestation by the second week of May. The aphid was reported as serious on alfalfa, also, from Delaware. Wisconsin reported the heaviest infestation in many years with serious damage in many alfalfa fields. Iowa had an exceedingly abundant population in the southern half of the State which moved northward as the season progressed. The Iowa infestation was primarily on red clover and damage was so severe that stands were destroyed and in some areas where farmers did not discover the infestation in time to apply insecticidal control they had to plow up their clover because of loss of stand.

Damage to red clover was also reported from Platte County, Nebraska. Relatively heavy damage was reported in legume fields in northern Missouri, southern Indiana and in scattered alfalfa fields in southwestern Idaho. Many of these infestations were on the decline or had reached non-economic levels later in the month.

Clover leaf weevil was also a very important forage crop pest during the month. This insect was much more abundant than usual in western areas of Pennsylvania. From 4 to 25 or more weevils and larvae per plant were found in many Illinois alfalfa and clover fields.

Serious damage to alfalfa was reported in Adams, Boulder, Weld and Larimer Counties, Colorado. Populations ranged up to 28 per plant in clovers and alfalfa in northern Missouri with some red and Ladino clovers being killed. Abundance was, also, reported from Delaware, and in wide areas of Michigan, Kansas, Indiana and Nebraska.

Reports of armyworm damage to small grains and grasses were first received about the middle of May. This development had been indicated due to earlier reports of heavy moth flights in several states including Tennessee, Delaware, Ohio, Indiana, and Illinois. Serious damage to small grains has been reported from the Delta area of Mississippi with as high as 60 "worms" per square foot. Also, during the latter part of the month, damage was reported from eastern areas of Virginia and North Carolina, areas of Tennessee, Georgia, Kentucky, Oklahoma, and southern Illinois. Considerable spraying was done in southern Missouri to control this pest.

European corn borer winter mortality observations in Illinois showed no unusual winter losses of this corn pest. About the normal 60-80 percent of live healthy larvae were found in re-surveyed fields this spring. South Dakota had a winter survival of approximately 65 percent with a large overwintering population in southeastern counties. As of May 16, pupation in Illinois was well along in the extreme southern and southwestern part of the State, and during the week of May 11 about 50 percent pupation was noted in old sweet corn stalks in Ulster County, New York. Moth emergence was reported from the Eastern Shore of Maryland May 1 and moths were abundant in Delaware during the week of May 11.

The alfalfa weevil which was reported from the eastern United States for the first time last year was causing noticeable injury to alfalfa in Kent and Sussex Counties, Delaware by early May of this year. Severe injury also occurred in Baltimore, Harford, and Kent Counties, Maryland.

17-Year Locust Appearing

PERIODICAL cicada, also known as the 17-year locust, is now makini its appearance in the northeastern part of the United States. The name 17-year locust results from the fact that the larvae spend 17 years underground. Some broods of the periodical cicada appear almost every year, but the brood appearing in 1953 (Brood X) will be the most numerous. Brood X will largely be found in a region bounded on the north by Pennsylvania, Ohio, Michigan and Indiana and on the south by North Carolina, Tennessee and northern Georgia.

The insect is relatively harmless, with damage resulting from the females laying their eggs in the twigs of young trees and vines. Hardwood trees, such as oaks and hickories, fruit trees, particularly apple, and grapes are among those favored by the female cicadas for egg laying.

Where control is desired, young trees may be protected from this insect by covering with cheese cloth or by applying the insecticide TEPP as a water spray at the time egg laying begins. TEPP kills the cicadas only by direct contact; consequently re-spraying at about three day intervals is necessary. The recommended spray is ½ pint TEPP - 20 percent concentrate or ¼ pint 40 percent concentrate per 100 gallons of water.

The Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture has just released Leaflet 340 "The Periodical Cicada" which discusses the life history, habits and control of this insect.

The first adults of Brood X were reported seen in Knoxville, Tennessee, April 30, in Arlington, Virginia, May 6, in Takoma Park, Maryland, May 10 and at Newark, Delaware, May 15.

•

Reach Sales Agreement

An agreement has been reached between the Niagara Chemical Division of Food Machinery and Chemical Corporation, and U. S. Industrial Chemicals Company, Division of National Distillers Products Corporation, for the sale and distribution of "Pyrenone Wheat Protectant" and "Pyrenone Grain Protectant" by the Niagara firm, it has been announced by U.S.I.

The agreement became effective in May, with Niagara participating in sales and distribution of "Pyrenone Wheat Protectant" during the forthcoming wheat harvest.

The wheat protectant, contains piperonyl butoxide and pyrethrins, and uses pulverized wheat as a diluent. The grain protectant, containing the same chemicals but using a different diluent, prevents insect attack on corn, rice, rye, barley, sorghums and other small grains in storage.

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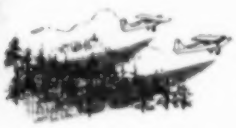
Dutch Elm Disease and elm phloem necrosis are the most destructive diseases of elm trees in the U. S. Spraying with a 1% DDT emulsion or oil solution at three intervals will control both diseases: before leaves appear, again when leaves are full-grown, and a third time about mid-August.

Mothproofing with EQ-53. USDA's new formula, containing 25% DDT by weight, is being pushed with strong educational campaigns directed at the housewife. EQ-53 is effective in treating washable woolens against clothes moths and carpet beetles.



The largest aerial spraying job in history was recently organized by pulp and paper companies to spray a million acres of balsam fir in Canadian forests. More than a million gallons of DDT formulation were used here to kill spruce budworm.

DDT in Sardinia. In a successful drive conducted over the past four years, American technological leadership spearheaded the battle to rid Sardinia of mosquitoes. Draining and spraying 1,300,000 possible breeding places on this rocky Mediterranean island resulted in a drop in malaria cases from 75,447 in 1946 to only nine in 1951.

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WASHINGTON *Report*

by

Donald G. Lerch

Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

A LONG term educational program of the fertilizer industry faces its biggest test in recent years when wheat growers make decisions on how much fertilizer they will apply this fall. If they use more, it can be assumed that farmers are convinced that liberal fertilizer application means more wheat per acre and the chance of greater profit. If sizeable numbers of farmers cut back, then they are not yet sold on industry's story.

Upon first thought it might seem that pending acreage reduction will automatically result in increased application, yet business men are keenly aware of the decline in farm income and feel that some "fertilizer money" is being spent for shoes and groceries. Some farm equipment companies, for instance, are experiencing sharp cuts in sales.

July 25 is the deadline for wheat farmers to vote on acreage allotments, which to become effective must be approved by two-thirds of those voting. A slim chance remains that Congress will change the law by increasing the legal size of reserve stocks. Consequently, Secretary Benson may be expected to delay proclaiming quotas until nearer the deadline.

* * *

Intensive interest in broad agricultural policy as it affects the intentions of farmers is evidenced in the June meetings of the American Plant Food Council and the National Fertilizer Association. Leaders of the industry are making a close examination of reports and papers presented by influential members of Congress and top government officials. Topics such as "Changing Policies of the USDA"; "Congress and Farm Policy"; "Under New Management in Washington"; and "A Solid Future For Agriculture" are evidence of the problems uppermost in the mind of industry executives.

Dr. Frank Parker, well known and widely respected director of soils research at Beltsville is accepting a special assignment in the Foreign Agricultural Service for work in India. His place at the N.F.A. meeting will be taken by Dr. O. J. Kelly, USDA'S recognized leader in the field of soil management.

Louis H. Wilson, Director of Information of the American Plant Food Council estimates that the farm magazines which participated in the Council's "Soil Builders Award Contest" represent over 15 million readers in paid circulation. Representatives of the two winning magazines receive special honors at the convention.

* * *

President Eisenhower's Beltsville inspection tour is considered one of the biggest things that ever happened at the USDA's research center. Researchists in both fertilizer and entomology jumped at the chance to give the President a quick review of their work and tasty samples of the foods resulting from their efforts.

Aside from the festive atmosphere in the Beltsville log cabin, famed eatspot of the scientists, many administrative officials are heartened by the enthusiasm for research shown by the President and Secretary Benson. From Beltsville's point of view, the downtown crowd often fails to take time to understand the real problems faced by the scientists, with the result that research suffers. Beltsville is looking for better days ahead.

* * *

The tremendous value of research is demonstrated in the continuing attention given X-disease of cattle. USDA officials are underscoring the results of research showing that X-disease is caused by highly chlorinated naphthalene compounds sometimes used in special purpose lubricants. They wish to avoid any confusion which could arise from a similarity of nomenclature between the phrase "chlorinated naphthalene" as it was used to refer to some pesticides.

Without entering into technical detail, the fact is simply that no highly chlorinated insecticide or weed killer has been found a causative agent of X-disease.

The disease which has resulted in extensive research in many states, was first found in New York twelve years ago. During ensuing years, it was reported in scattered areas throughout the nation, culminating in the Texas outbreak which began late last year where about 15 thousand head were affected.

Until the cause was found, the pesticide industry was plagued with suspicion and innuendo. Speculation about the disease was often linked to pesticides. The unknown captured the imagination of some writers who capitalized on sensationalism and captured front pages. Now that the cause is known, scientists are on guard against any conjectures which could cause damage to the pesticide industry.

The oil industry is continuing its program to keep the causative agent from becoming accessable to cattle through pelleted feeds and other sources. The industry is making excellent use of its agricultural program through the chairman of the Agricultural Committee, M. C. Enright, Gulf Oil Company and Lowell Kern, the executive secretary. Notable progress has already been made.

Although scientists can not put a stopwatch on their work and predict when they will find the answers to problems such as this, the

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case of X-disease clearly demonstrates the value of a research plant capable of attacking complex problems.

• • •

With the prospect of grain being piled into Liberty ships and spilled into airplane hangars, the government has issued a slow-down on parts of the grain clean-up campaign pending further study by a 15-man committee to be appointed jointly by the USDA and the Federal Security Agency. John H. Davis, head of the CCC and C. W. Crawford, Food and Drug Commissioner, have much of the responsibility for appointing the committee and outlining its work.

Announcement of a new program is considered to hinge on the development of a fast, accurate test for weevils along with more research on the general field of grain protection. A well-coordinated information program is also considered essential.

It is not believed likely that a "get tough" drive will be launched anytime soon. The job of finding storage for grain is difficult enough without the added problem of new standards in the opinion of some grain men. Everyone endorses the objectives of the cleanup programs. Differences are centered on extent and timing.

• • •

Washington observers feel there is a good chance the Miller pesticide bill will not run into serious difficulty during hearings scheduled this month. Some differences exist among various interested groups, but they do not appear to be serious.

In general, most parties feel the Bill recognizes the specialized problems inherent in the pesticide field. They express hope that this same attitude will be carried over to those finally given administrative responsibilities. Such a result would be generally welcomed and considered definite progress for the industry. Getting "a divorce from the tight embrace" of general chemicals is difficult, industry leaders say.

• • •

Behind the headlines pointing to the USDA's favored position in getting an increased budget, is BEPQ's balance sheet showing a decrease. Among the cutbacks planned by the Bureau are activities related to sweetpotato weevil, Japanese beetle and peach mosaic. What money is available for this work will be used largely in preparation for turning these activities over to the states.

(*Turn to Page* 147)

Monsanto Reports on Polyelectrolytes and Discusses Use of Liquid Type

Soil Conditioners

ADDITIONAL data on the role of polyelectrolyte soil conditioners are reported in a recent paper by Howard K. Nason, Monsanto Chemical Co., St. Louis, from work done by both the original workers and by more than 500 independently functioning technical cooperators.

Mr. Nason's paper outlines briefly the basic purpose of soil conditioners, stating that soil which has been cultivated either manually or mechanically to the condition of a good seed-bed, and treated with a conditioner, will retain its porous, friable character in the face of excessive moisture or the sealing and "baking" effects of hot sunlight. "This stabilization of soil aggregates of suitable size results in important secondary benefits, including increased aeration, improved workability, more favorable microbial relationships, increased emergence, faster early growth, increased root formation, improved drainage, decreased erosion, decreased crusting and ultimately, improved crop response."

He pointed out that many tons of polyectrolyte conditioners have been applied to the soil in diversified laboratory and field studies during the past year and that these tests have underscored certain fundamental facts concerning the use of soil conditioners.

First, he said, a soil must be capable of improvement and responsive to treatment. The optimum degree of improvement will be observed in soils of high clay or silt content, but improvement of some very sandy soils can be obtained under some conditions. Benefits sometimes are obtained, even in treatment of very good soils through prolongation of the desired optimum structure.

Secondly, he pointed out that soil must be cultivated before, during, or after application of conditioners. Claims that satisfactory soil conditioning effects can be obtained by adding conditioners to unprepared surfaces of problem soils, without tilling, are without foundation.

"Third, sufficient conditioner must be applied to produce the effect desired," he said. "The objectives of the user (such as the type of planting to be done) and the condition and type of soil must be carefully considered. It is an unfortunate fact that application instructions of some formulators have called for insufficient conditioner to achieve a noticeable improvement of structure.

"A fourth point which, despite its obviousness, has become somewhat obscured by the multiplicity of products now commercially available, is that an effective product must be used, and that the product must be keyed to the type of application made. It is misleading, in gauging effectiveness, to depend solely on the label-listing of percentage of active ingredient in a conditioner. The important point is not the amount of active ingredient contained in a formulation, but how effective that ingredient is and what it will do when applied in accordance with the manufacturer's recommendations.

"For example, many of the products now being marketed are based on hydrolyzed polyacrylonitrile; some of these list an active ingredient content of roughly 83 to 87 per cent. This type product has proved useful in certain specialized applications, and will probably prove most effective in others still to be uncovered. However, it has been demonstrated that in home gardening and agricultural applications a modified vinyl acetate maleic acid compound (the active ingredient of "Krilium" soil conditioner formulations for these uses) is 30 to 300 percent more effective. In choosing a product, it is important to remember, too, that variations in quality and effectiveness can occur in different lots of the same product

(*Turn to Page* 143)

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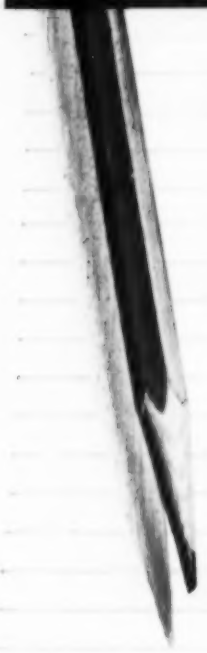

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Suppliers' BULLETINS

Fumigation Manual Out

Michigan Chemical Corporation, Saint Louis, Mich., has published a new manual on fumigation techniques. Called "Pestmaster Fumigation Manual," the 16-page illustrated book describes the most successful means of rodent and insect control in dairies, food and mea packing plants, and other storage areas for tobacco, grain and other products. Considerable emphasis is also placed on fumigation of soil for control of all stages of insect life and of all weed and grass seed in nurseries and other plant seed beds. Fumigation for control of pink boll worm is described.

In each type of application the preparation, equipment and material required is outlined step by step and recommended dosages are listed in detail. Safety and precautionary measures are stressed. The manual is available from Michigan Chemical Corporation, Saint Louis, Michigan.

•

New Hypo Pump Info.

Use of an entirely new impeller design said to improve priming qualities and pump output with the same power is a feature of the new Hypro General Purpose Pump, manufactured by Hypro Engineering, Inc. Mineapolis, Minn.

The new impeller, moulded in rubber, has 12 vanes (twice the conventional number) giving greater displacement and improved pump priming. Sharp lateral wiping edges on each vane minimize friction and improve mechanical efficiency of the pump up to 15 percent, it is claimed.

The pump is available in three models—½", ¾" and 1" port sizes. It will handle dirty water without clogging and may be operated with electric or gasoline motors, or a tractor take-off.

Uses for the pump include the farm, home, and laboratory.

For literature and price information, write Hypo Engineering, Inc., 404 No. Washington Ave., Minneapolis 1, Minn.

•

New Southern Clays Carrier

Southern Clays, Inc., has announced a new insecticide carrier, "Seminole." According to its makers, it is a predispersed aluminum silicate, which when mixed with water thoroughly disperses the particles of aluminum silicate without the addition of wetting agents. "Seminole" can be mixed with solids as high as 60% with very low viscosity. Southern Clay describes the product as a water-washed product purged of all grit, making it very low in abrasion. It has a uniform pH and particle size distribution. More detailed information can be obtained by writing to the sales offices at 35 Rector St., New York 6, N. Y. or to the plant at Gordon, Georgia.

•

Has Acid-Resistant Tanks

Corrosion-resistant tanks made from unplasticized polyvinyl chloride, are being offered by American Agile Corporation, Bedford, Ohio. According to the makers, the tanks are mainly of welded construction, self-supporting, offering resistance to corrosion of the interior as well as exterior. The material is resistant to most mineral acids, alkalis, inorganic salts and a large number of organic compounds at temperatures up to 170° F., according to the company. Tanks are built to customers' specifications and are furnished with "Agilside" inlets and outlets and standard flanged fittings to permit incorporation into existing or new installations. Complete information is available from American Agile Corporation, P. O. Box 168, Bedford, Ohio.

•

Dorr Co. Lists Services

The Dorr Company, Stamford, Conn., engineers, have issued a new bulletin describing the company's service in planning and constructing fertilizer plants. According to the bulletin, the firm's service includes laboratory testing; pilot plant demonstration; flowsheet preparation; economic analysis; plant design and specifications; purchase of equipment; plant construction; and supervision of initial operation.

Copies of the bulletin are available from the Dorr Company, Engineers, Barry Place, Stamford, Conn.

•

Soil Conditioner Info.

Tests rating the effectiveness of 16 commercially available synthetic chemical soil conditioners in stabilizing soil aggregation have been completed recently by the Doane Agriculture Service and the Agricultural Institute of St. Louis, Mo. A report which summarizes the results of these tests may be obtained by writing Doane Agricultural Service, 5144 Delmar Blvd., St. Louis, Mo.

•

Sprayer Handbook Published

The National Sprayer and Duster Association, Chicago, has just published a new 40-page illustrated manual offering suggestions as to the best type of sprayer or duster to be used for control of specific insects, weeds, plant diseases; describing methods of determining how much of a given toxicant to use; and whether high or low concentrations should be used. The new publication is to be used as a handbook containing information on all phases of the subject, simplified for practical use.

The manual describes the great variety of equipment that has been

(*Turn to Page* 149)

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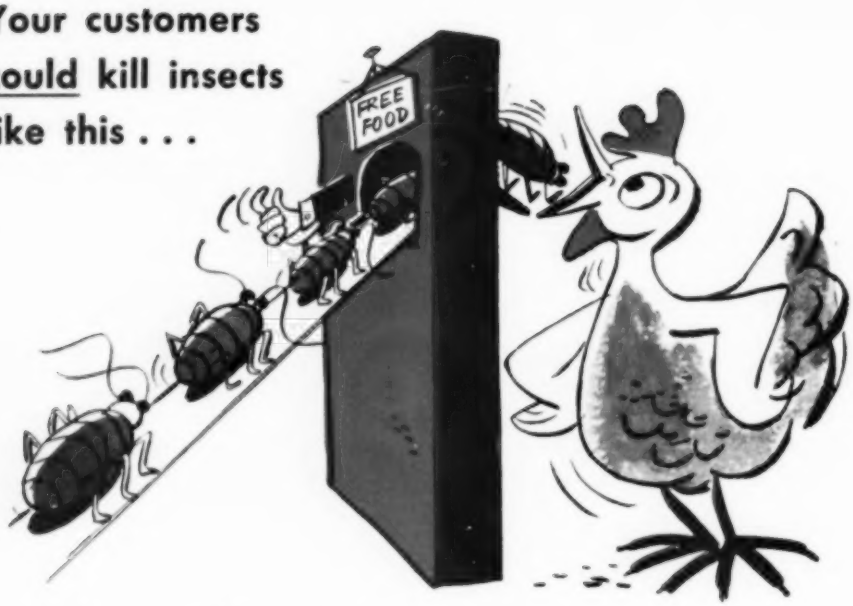

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Technical BRIEFS

Cotton Fertilizers in Calif.

Nitrogen fertilization increased cotton yield in a series of experiments designed to determine the kind of fertilizer and—specifically—the amount of nitrogen necessary for maximum production on soils of the San Joaquin Valley.

The actual increase from nitrogen varied from 8.6% to 111.5% over unfertilized plots and varied with rates of nitrogen application, soil type, past fertilizer and cropping history.

Yield increases from the use of phosphate fertilizers were smaller than from nitrogen and its need is not general. Adequate available potash also occurs naturally in most California soils used for cotton production.

Commercial fertilizers have been used to maintain the soil fertility once partially supplied by suitable crop rotations. At present, more than 90% of the continuous cotton production receives commercial fertilizer to maintain high yields and economic production.

Tests were made under ordinary conditions. Ammonium sulfate was used as the nitrogen source to supply 50, 100, and 150 pounds actual nitrogen an acre. Ammonium phosphate-sulfate was used as the nitrogen-phosphate carrier, to supply 100 pounds actual nitrogen and 120 pounds phosphoric acid an acre. A mixed fertilizer, 10-12-10, with ammoniacal nitrogen, phosphate and sulfate of potash was used as the complete fertilizer material. This material supplied 100 pounds actual nitrogen, 120 pounds phosphoric acid and 100 pounds of potash an acre.

The tests were arranged in a randomized block design and all 4-row treatments were replicated five times. Seed cotton was harvested from all treatments in two pickings made by a mechanical harvester.

A large number of soil series exists, but it is possible to group certain ones which have similar major characteristics and common soil forming materials. These similar soils, called series groups, are used here to characterize effects of fertilization on cotton production.

The Cajon series group responded to nitrogen fertilization and in these tests gave maximum yields when supplied with 50 to 100 pounds actual nitrogen an acre. The average increase in yield from nitrogen fertilization varied between 20.7% and 29.3%. There was no beneficial effect of phosphate or potash fertilization at these test locations.

The Foster series group produced maximum seed cotton yields with about 50 pounds actual nitrogen an acre. On the Chino series, the fertilizer plots were not statistically different, but are a little better than the unfertilized. The actual average yield increase with nitrogen was about 8.6%. Phosphate and potash did not benefit cotton production at this location.

The Panoche series group are rather important cotton producing soils. Maximum yields were obtained on these test soils with 150 pounds actual nitrogen an acre with the greatest increase averaging 111.5% above unfertilized cotton. Each rate of nitrogen significantly increased yields up to the 150-pound rate. Observational plots receiving 200 pounds actual nitrogen were not materially different than the 150-pound rate.

Phosphate with nitrogen produced significantly higher yields than where nitrogen was used alone. This increase improved yields by 12.6% over similar nitrogen rates. Potash combinations in a complete fertilizer significantly reduced seed cotton yields as compared with the same rates without potash.

Specific soil series groups varied in their requirement for fertilizer. Nitrogen fertilization generally improved yields on all test locations and affected largest crop improvement. Phosphates have not generally improved yields and the increase has been smaller than with nitrogen. Potash has not been found lacking in areas where tests were conducted.

—D. S. Mikkelsen, assistant Agronomist, University of California, Davis, in *California Agriculture*, May, 1953.

•

Study Pickleworm Control

Results of tests made with a number of insecticides for control of the pickleworm *(Diaphania nitidalis* (Stoll)) and the melonworm *(Diaphania hyalinata* (L.)) have been summarized by W. J. Reid, Jr. and F. P. Cuthbert, Jr., Bureau of Entomology and Plant Quarantine, U.S.D.A., in cooperation with the South Carolina Agricultural Experiment Station, Clemson.

The insects, serious pests of fall crops of squash and cucumber in the South Atlantic and Gulf States, also frequently cause damage in adjoining states and occasionally as far north as Illinois and Connecticut.

These pests spread northward each spring and summer from semi-tropical areas. The melon aphid *(Aphis gossypii* Glov.) and several species of cucumber beetles, cause damage to cucurbit crops at times.

Experiments conducted between 1930 and 1934 showed that adequate protection against the melonworm and a fair degree of control of the pickleworm could be obtained by frequent applications of lead arsenate, potassium hexafluoaluminate, cryolite, or barium fluosilicate. Calcium arsenate, paris green, pyrethrum, and rotenone usually were less effective against the pickleworm. Sul-

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fur proved to be of considerable value as a fungicide and of some value as an insecticide in the dust mixtures.

In 1948, laboratory cage and field-plot experiments were undertaken to develop more effective and safer measures for the control of the pickleworm and associated insects. Lindane was the most effective material given extensive trial. A1-percent lindane dust applied weekly at the rate of about 20 pounds per acre, or sprays providing a comparable dosage, gave excellent control of all insects present on cucumbers and squash. There were indications, however, that the use of lindane during the fruiting period may impart a slight off-flavor or off-odor to cucumbers, and that certain varieties of Irish potatoes may be similarly affected when the crop immediately follows lindane-treated cucumbers.

Parathion, although tested less extensively than lindane, proved only slightly less effective against the pickleworm and was as toxic as lindane to the melon aphid and the other insects. A purified grade of DDT usually proved inferior to lindane but superior to cryolite against the pickleworm. However, a marked increase in the melon aphid population often followed the use of DDT and cryolite. Aldrin, dieldrin, and endrin showed considerable promise against both insects in limited trials.

Insecticides that proved less effective against the pickleworm were chlordane, methoxychlor, CS-674A, CS-645A, CS-708, tetraisopropyl pyrophosphate, TDE, Q-137, heptachlor, Metacide, and nicotine plus either bis(*p*-chlorophenyl) sulfide or polyethylene glycol (600) monolaurate.

Dusts containing rotenone, pyrethrum, sabadilla, allethrin, and ryania did not provide adequate protection to cucumber fruits against moderate to heavy infestations of the pickleworm, even when supplemented with several additives.

Zineb was found to have some toxicity to the pickleworm. Weekly use of this material for disease control did not give adequate protection to cucumbers and squash against that insect, but evidently made it possible for control to be obtained more easily with lindane and certain other insects.

Several of the insecticides were found to be phytotoxic to cucumbers. BHC, nicotine with bis(*p*-chlorophenyl) sulfide, and dusts impregnated with both technical and purified DDT caused severe chlorosis of the plants and greatly reduced the yield of fruits. Less serious injury to the plants and no apparent effect on yields resulted from use of ordinary DDT dusts (both grades) and of TDE, methoxychlor, chlordane, endrin, zineb, and nicotine plus polyethylene glycol (600) monolaurate.

Insecticide residues as high as 12.2 and 82 p.p.m., respectively, were found on cucumbers when gamma BHC and cryolite were applied weekly until the day of harvest. These residues were reduced to 7.7 and 16.2 p.p.m., by a commercial brushing or washing machine. Residues that followed similar use of lindane, purified DDT, parathion, and methoxychlor were not more than 1.6 p.p.m.

—B.E.P.Q. Bulletin E-856, May, 1953.

•

Fertilizer Combinations Best

That fertilizer materials do their best work in combinations is indicated in a report from the University of Illinois which says that a combination of lime, phosphate and potash resulted in an 81-bushel average corn yield between 1949 and 1952, representing a 55-bushel increase over the check plot.

Yet, when used alone on different fields, yields were increased only 25 bushels per acre by use of the same fertilizers. The experiment was handled in this manner, according to the University:

On one plot of untreated land potash was used alone. It did not increase yields at all. On another plot, phosphate alone increased yields five bushels per acre. Lime alone, the best performer, increased yields 20 bushels.

To find out what each plant food was worth in the plant food team, the Illinois agronomists gave plots the full treatment minus one plant food. When they left out phosphorus, yields fell from 81 to 73 bushels. Phosphorus was worth eight bushels here on full treated land, only five bushels on untreated land.

Leaving out potash cut yields 29 bushels to the acre. When used alone it did no good.

When limestone was left out of the full treatment, yields fell 48 bushels. Alone it was worth 20 bushels.

Potash and phosphorus together without limestone were worth only nine bushels of corn. When added to limed land, they raised yields 37 bushels.

•

New "Orthocide" Fungicides

California Spray-Chemical Corp., Richmond, Calif. is marketing a new fungicide, "Orthocide" containing (N-trichloromethylthio tetrahydrophthalimide) (Captan) available either as a wettable powder or dust. The material is used both as a fruit spray and seed protectant.

The makers report that the 50% wettable product, used as a fruit spray, has produced "larger crops of finer-appearing, better-keeping fruit" and provides protection against most of the fruit diseases. According to Leo Gardner, research director for the company, data has been collected from independent researchers and growers to indicate the efficiency of the new product.

Reports from Maryland state that treated apple trees yielded four times as many apples as adjacent orchards sprayed with standard sulfur sprays. "On the basis of these tests, two of the country's largest apple growers used the spray program last season on some 3,800 acres of apples," Mr. Gardner says, and the results were higher profits and the "finest-looking apples in Maryland's history," according to grading experts.

Similar results are reported from Michigan and Hood River, Oregon, where storage rot occurred in less than 1% of the apples harvested from "Orthocide"-treated trees. The incidence of storage rot normally ranges from 20% to 70%, Mr. Gardner states.

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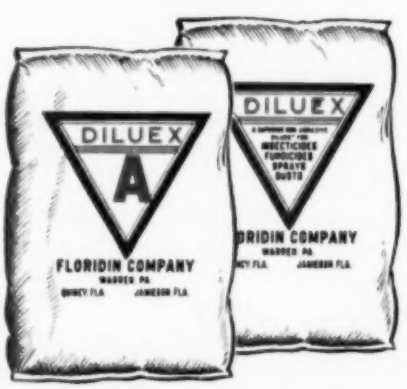

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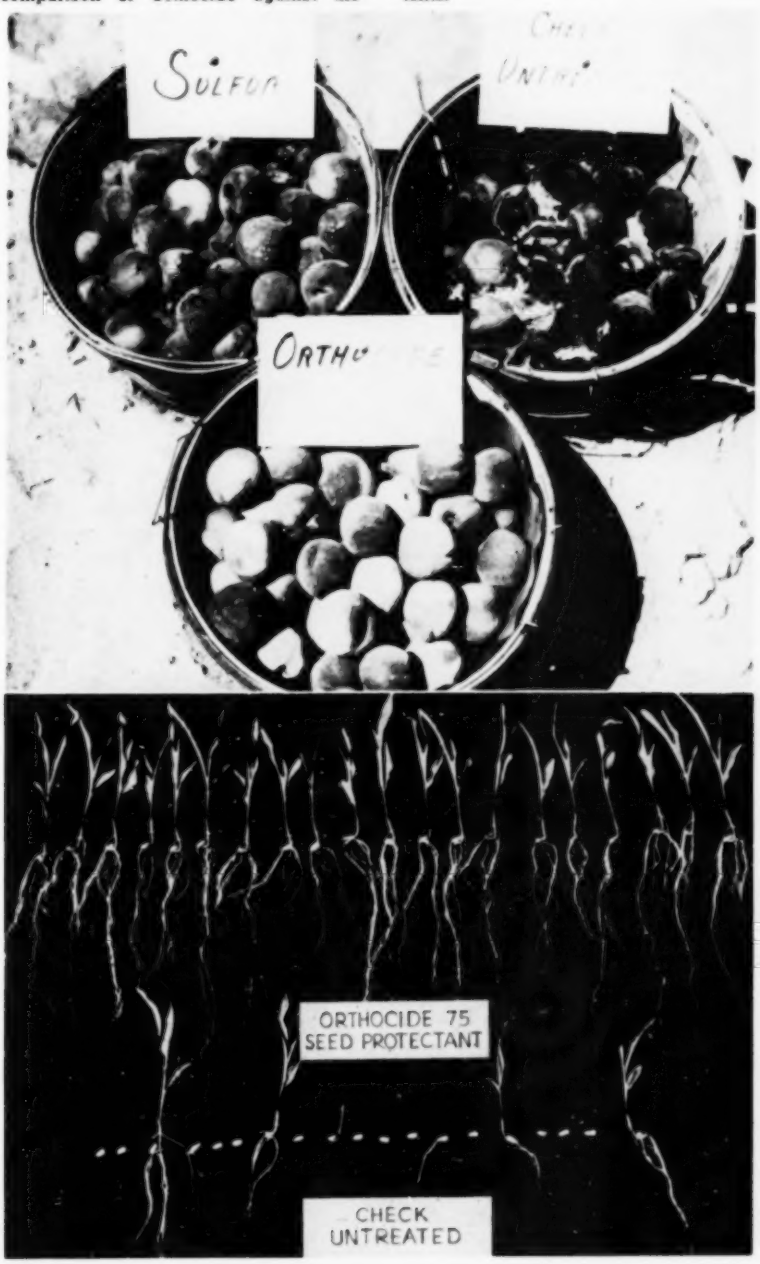
Tests conducted at Purdue University, showed 90% of apples from treated trees to be in good condition at the end of a long storage period, whereas all apples receiving only standard sprays were unsaleable at that time, the report continues.

That the product has shown advantage on other fruits including pears, peaches, citrus, strawberries, apricots, cherries and table grapes in both keeping qualities and disease control, is claimed for the material.

Experiments conducted by Dr. C. S. Reddy, Iowa State College, indicate the value of "Orthocide" as a seed protectant. These tests, conducted in the 1951 and 1952 growing season, found that treated seed corn yielded 10.5 more bushels of corn per acre than untreated seed, and 4 bu. per acre more than any other standard fungicide. Superior seed protection was also reported in the cases of cotton, soy beans, alfalfa, red clover, flax, bluegrass and oats. However, it does not control smut on oats or other grains.

As to toxicity, Dr. James W. Hansen, who directed the phytotoxicity and toxicology tests, reports that the products, in recommended dosages shown on the labels, "have been proved to be non-injurious to plants." Further toxicological studies with warm-blooded animals show "Orthocide" to be "quite bland to the operator as compared to many of the fungicides currently used."

The photos below are self-explanatory. The above shot makes a comparison of Orthocide against the check on peaches, while the lower picture shows the effect of seed protectants.



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Offers OMPA Bulletin

Octamethylpyrophosphoramide (OMPA, Schradan), systemic insecticide, is the subject of a technical bulletin published by Monsanto Chemical Company's Organic Chemicals Division.

OMPA, approved recently for spray applications to control aphids and spider mites on ornamentals, kills insects feeding on plant fluids. The chemical dissolves readily in water and is easily applied as a simple solution.

The bulletin emphasizes careful handling of the toxicant and includes a section on the storing, handling and formulating of OMPA and other organic phosphates. In addition, it contains information about the application and effectiveness of OMPA as well as sample formulations for aerosol mixtures, liquid formulations and emulsifiable concentrates.

•

Palmer's "Aphids" Available

"Aphids of the Rocky Mountain Region" by Miriam A. Palmer has just been published by the Thomas Say Foundation. It consists of 452 pages, 8 colored plates, and 455 figures of line drawings providing additional accuracy in identification. Keys are provided for the subfamilies, tribes, genera and species.

Although the title indicates a restricted area, as a matter of fact,

(*Turn to Page* 161)

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INDUSTRY Patents

The information below is furnished by patent law offices of

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The data listed below is only a brief review of recently issued pertinent patents obtained by various U. S. Patent office registered attorneys for manufacturers and/or inventors. Complete copies may be obtained direct from Lancaster, Allwine & Rommell by sending 50c for each copy desired. $1.00 for Canada. They will be pleased to give you free preliminary patent advice.

2,633,418. Herbicidal Composition and Method of Weed Control. Patent issued March 31, to Lawrence B. Scott, Oakland; Richard R. Whetstone, Orinda and Johannes Van Overbeek and Rene Blondeau, Modesto, Calif., assigners to Shell Development Co., San Francisco.

A composition of matter comprising 90-40% of a hydrocarbon oil having at least a 10% and less than 50% aromatic content, said oil boiling within the range of from about 275° F. to about 550° F. and 10-60% by weight of said composition of a cycloaliphatic carboxylic acid soluble in said oil at 20° C., and having between 7 and 20 carbon atoms per molecule, said acid having a water solubility at 20° C. of at least 0.0003 gram per 100 grams of water.

2,633,444. Alkali Metal Nitrite and Ammonium Salt of an Inorganic Acid Gas Generating Composition Containing a Vaporizable Pesticide. Patent issued March 31, to Douglas J. B. Marke, West Kilbride, Scotland; assignor to Imperial Chemical Industries, Ltd., London, England.

A fumigating composition capable of propagating throughout itself at ordinary atmospheric pressure and particularly at slightly higher pressure an exothermic reaction when initiated by local heating, said composition consisting of a mixture comprising from 7% to 30% by weight of a thermally vaporizable pesticidal compound and substantially stoichiometrically equivalent quantities of an alkali metal nitrite of an atomic weight up to and including 40 and a non-deliquescent, non-explosive ammonium salt of an inorganic acid, the heat of said reaction being insufficient to decompose the said pesticidal compound.

2,634,029. Spreader with Means to Adjust the Discharge Therefrom. Paent issued April 7, to Edmond A. Juzwhk, Chicago, Ill., assignor to Ezee Flow Corporation, Chicago. In a material spreader, a hopper having at least one discharge port in the bottom thereof, at least one ported slidable shutter below and adjacent to said bottom, means on said hopper for supporting and guiding said shutter, a first lever pivotally connected to said hopper, means connecting said first lever to said shutter and adapted to translate oscillatory movement of said first lever into a reciprocal motion at said shutter, a hand lever, means pivotally supporting said hand lever on said material spreader, a link connecting said hand lever to said first lever, a turnable stop plate the axis of rotation of which is in the plane of rotation of said hand lever, said stop plate being positioned on said material spreader to limit rotation of said hand lever in that direction which causes said shutters to move to uncover said discharge ports, said stop plate having a plurality of flat detent surfaces lying on radii of different lengths, and each substantially perpendicular to its respective radium, and means for locking said stop member against turning.

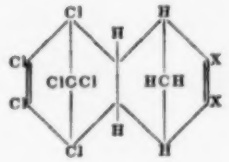
2,634,226. Insecticidal Unsymmetrical Diethyl Dioctyl Pyrophosphates. Patent issued April 7, to Gennady M. Kosolapoff, Auburn, Ala., assignor to Monsanto Chemical Co., St. Louis, Mo. An unsymmetrical diethyl dioctyl pyrophosphate.

2,634,227. Insecticidal Unsymmetrical Diethyl Diphenyl Pyrophosphate. Patent issued April 7 to Gennady M. Kosolapoff, Auburn, Ala., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,635,955. Fertilizers and Processes of Producing Them. Patent issued April 21 to Antime Constant, Paris, France, assignor to Societe Anonyme des Manufacturers des Glaces et Produits Chimiques de Saint-Gobain, Chauny & Cirey, Paris, France. The process of decomposing phosphates for the manufacture of fertilizer that comprises preparing a fluid mixture by reacting phosphates of fertilizer grade wtih acid comprising sulfuric acid, and nitric acid of concentration about 90% in amounts producing a fluid mixture mainly composed of phosphoric acid and calcium nitrate having a density about 1.6, circulating the said fluid mixture and adding to it, separately, further quantities of such phosphates and acid so that the phosphate may first tend to react with phosphoric acid of the fluid mixture and thereafter with the nitric acid, maintaining a temperature of about 35° C. in the fluid mixture, withdrawing fluid mixture from the general mass thereof, adding to the fluid mixture thus withdrawn raw material of fertilizer grade in quantity sufficient to form a fertilizer and subjecting it to immediate solidification and particulation by cooling and mechanical disruption.

2,635,945. Production of Potassium Nitrate from Wyomingite and Sodium Nitrate. Patent issued April 21, to Robert D. Pike, Greenwich, Conn. The method of producing sodium and potassium nitrates from potassium silicate base exchange minerals and sodium nitrate, which comprises heating a potassium silicate base exchange mineral, sodium nitrate and water, in a closed container under pressure, to effect base exchange between the sodium of said nitrate and potassium of said mineral, forming a solution containing sodium and potassium nitrates, separating the resultant solution from solid matter and evaporating it to remove water, and to crystallize out sodium nitrate, then cooling to crystallize mixed crystals of sodium nitrate and potassium nitrate, separating these from the mother liquor remaining therein, and recirculating the mother liquor to the evaporator.

2,635,977. Polycyclic Insecticidal Dienes. Patent issued April 21 to Rex E. Lidov, Denver, Colo., assignor, by mesne assignments, to Shell Development Co., Emeryville, Calif. A compound having the structure:



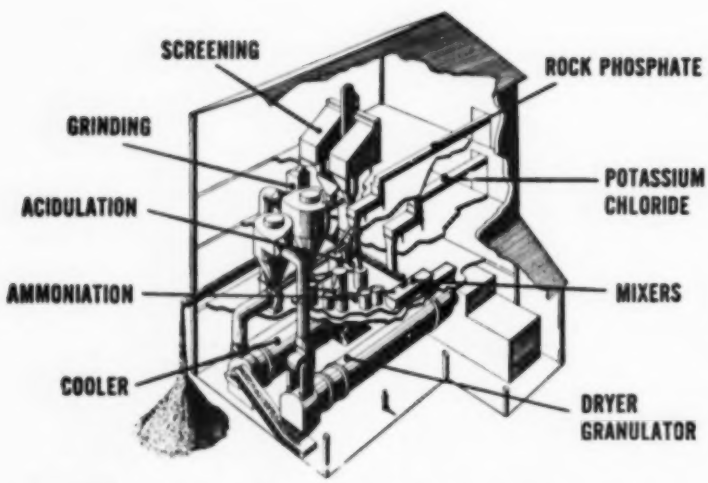
wherein X is of the group consisting of (1) hydrogen, and said compound has a melting point of about 100.5 to about 104.5° C. and (2) carbethoxy, and said compound has a melting point of about 119° C.

8. The method which comprises apply-

VII advantages

of the ST-GOBAIN Process for the manufacture of Complete Nitrophosphate Fertilizers

1. The St-Gobain process manufactures granulated fertilizers in one continuous automatic operation. The same equipment can be used to produce various $N\text{-}P_2O_5\text{-}K_2O$ formulae.
2. Can produce end product in any sized granules desired.
3. St-Gobain plants are available in capacities of 30,000 tons of produced nitrophosphates per year and up.
4. You benefit from improvements and experience of many years of successful operation on a large industrial scale.
5. St-Gobain process, with the same equipment, permits the use of either sulphuric or phosphoric acid according to the formula of the required fertilizer.
6. Capital investment is low due to the use of simple equipment.
7. Operating costs are low due to a continuous automatic operation and high yields.



Examples of Formulae Produced by St-Gobain Process

N%	P_2O_5%	K_2O%	
10	10	17	(sulfo-nitric acidulation)
11	11	11	" " "
10	15	20	(phospho-nitric acidulation)
12	15	18	" " "
12	12	20	" " "
14	14	14	" " "
10	20	20	" " "

For complete information write, wire or phone:

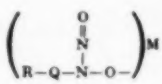
GENERAL INDUSTRIAL DEVELOPMENT CORP.

270 PARK AVE., NEW YORK 17, N. Y.

AGENTS FOR ST-GOBAIN PROCESS

ing to insects and their habitats a compound of claim 1.

2,635,978. SALTS OF N-NITROSO PHENYLHYDROXYL AMINES AS FUNGICIDES AND BACTERICIDES. Patent issued April 21, to John T. Massengale, Wyandotte, Mich., assignor to Sharples Chemicals, Inc. A method for protecting a plant against the growth of plant attacking bacteria and fungi, comprising applying to the environment of said plant a compound having a structural formula as follows:



where in M is a cation selected from a group consisting of sodium, potassium, calcium, barium, magnesium, zinc, copper, aluminum, iron, mercury, alkylammonium having from 1 to 3 carbon atoms in each alkyl group, alkanolammonium having from 2 to 3 carbon atoms in each alkanol group, and mixed alkylalkanolammonium having from 1 to 3 carbon atoms in each alkyl group and from 2 to 3 carbon atoms in each alkanol group; wherein *x* is a number corresponding to the valence of M; wherein Q is the phenyl radical; and wherein R represents from 0 to 1 substituents on the aromatic ring selected from the group consisting of halogen, alkyl, alkoxy, aryloxy, and aryl.

2,635,979. POLYCYCLID INSECT TOXICANT. Patent issued April 21, to Rex E. Lidov, Denver, Colo., assignor, my mesne assignments, to Shell Development Co., Emeryville, Calif. A compound selected from the group consisting of (1) 1,4,5,8,9,10 - trimethano - 1,2,3,4,13,13-hexachloro - 1,4,4a,5,6,7,8a,9,9a,10,10a - dodecahydroanthracene melting at from about 173 to about 175° C., (2) 1,2,3,4,-10,10 - hexachloro - 1,4,4a,5,6,7,8,8a, - octahydro - 1,4,5,8 - dimethanonaphthalene melting at from about 77 to about 78° C., (3) 6-chloro, (4) 6,6-dichloro, (5)-6-acetoxy, (6) 6-hydroxy, (7) 6-phenyl, (8) 6-keto, (9) 6,7 dimethyl, (10) 6,6,7-trimethyl, and (11)) 6-ethyl-7-methyl derivatives of said dimethanonaphthalene.

8. As an insecticidal composition of matter a compound of claim 1 disseminated in an insecticidal adjuvant as a carrier therefor.

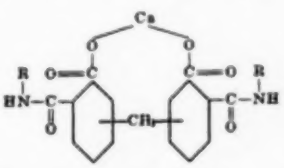
2,636,815. AQUATIC HERBICIDE. Patent issued April 28, to Nicholas M. Molnar, New York, and Ernest Segessemann, Woodridge, N. J. A composition of matter suitable for killing waterweeds comprising a homogeneous mixture of about 65 parts of coal tar naphtha having specific gravity of 0.86, about 35 parts of hexachlorethane and about 5 parts of an emulsifying agent, the finished product having a specific gravity greater than 1.

2,636,816. BETA-HALO PROPIONIC ACIDS AND DERIVATIVES AS PLANT GROWTH REGULANTS. Patent issued April 28, to William D. Stewart, Yonkers, N. Y., assignor to the B. F. Goodrich Co., New York. The method of altering the growth characteristics of plants which comprises applying to the plant structure a composition made up of an essential active ingredient uniformly associated with an inert diluent as a carrier therefor, the essential active ingredient being present in a concentration of about 0.001% to 5% by weight and being a compound selected from the class consisting of acids have the formula

$$X\text{-}CH_2CH_2COOH$$

where X is a halogen atom, and derivatives there-of capable of being converted to the free acid through hydrolysis involving one molecule of water.

2,636,839. INSECTICIDAL COMPOSITIONS. Patent issued April 28, to Herschel G. Smith, Wallingford; Mark L. Hill, Boothwyn, and Troy L. Cantrell, Lansdowne, Pa., Assignors to Gulf Oil Corp., Pittsburgh, Pa. An insecticidal composition comprising at least one insecticide toxicant, a solvent therefor, and a condensation product of formaldehyde and a substantially neutral calcium salt of an N-alky phthtalamidic acid, said condensation product having the following formula:



wherein R is an alkyl group having from 8 to 20 carbon atoms.

2,636,840. INSECTICIDAL COMPOSITIONS COMPRISING BENZYL OR TETRAHYDROFURFURYL ESTER OF MUCOCHLORIC ACID. Patent issued April 28, to Horace D. Brown, Plainfield, N. J., assignor to Merck & Co., Rahway, N. J. An insecticidal composition containing as an active ingredient a mucochloric acid ester selected from the group consisting of benzyl and tetrahydrofurfuryl esters, and a carrier therefor.

Trade Mark Applications

SNORKLE, in sans serif capital letters, for soil conditioning material. Filed Nov. 12, 1952, by Karlson-Scott Chemical Corp., Ft. Lauderdale, Fla. Claims use since September 19, 1952.

MIRACLE, in Cheltenham caps and lower case, for fertilizer for trees and plants. Filed Apr. 27, 1951, by Ra-Pid-Gro Corporation, Dansville, N. Y. Claims use since January, 1940.

GARDEN OF EDEN, in old English type, for plant food. Filed Mar. 18, 1952, by James W. Owen, doing business under the name of Kruse Nurseries, Bloomington, Ill. Claims use since Jan. 24, 1952.

NITRANA, in Onyx capital letters, for nitrogen-containing solutions, suitable for use as fertilizers and in the manufacture of fertilizers. Filed Oct. 7, 1952, by Allied Chemical & Dye Corp., New York. Claims use since July 11, 1952.

BIG BOY, in heavy capital letters, for fertilizers. Filed Oct. 10, 1952, by Oklahoma Fertilizer & Chemical Co., Oklahoma City, Okla. Claims use since Aug. 1, 1952.

SPEN-KILL, in stencil capital letters, for weed killer. Filed Nov. 17, 1952, by Spencer Chemical Co., Kansas City, Mo. Claims use since Oct. 30, 1952.

MALATHION, in sans serif capital letters, for insecticide. Filed Jan. 2, 1953, by American Cyanamid Co., New York. Claims use since Dec. 9, 1952.

RYANEXCEL, in tall capital letters, for synergized ryania concentrate for use in the agricultural field for the control of economically important crops and field pests. Filed July 28, 1950, by S. B. Penick & Co., New York. Claims use since Jan. 3, 1950.

CHAPMAN, in boldface sans serif capital letters, for wood preservatives, wood treating chemicals, insecticides, fungicides, parasiticides, weed killers, and chemicals for defoliating vegetation. Filed Oct. 11, 1952, by Chapman Chemical Co., Memphis, Tenn. Claims use since Aug. 1, 1946.

BRASSICOL, in German-style script, for weedicides, insecticides and plant, grain and seed disinfectants. Filed April 16, 1952, by Farbwerke Hoechst Vormals Meister Lucius & Bruning, Frankfort-on-the-Main-Hochst, Germany. Applicant claims ownership of German registration No. 364,834, dated Mar. 3, 1927.

BINSECTA-CIDE, in hand-lettered caps and lower case, for insecticidal preparation for residual spray-concentrate for use in grain elevator and farm storage units, box cars, warehouses, floor, feed and rice mills and other cereal or grain processing plants. Filed July 5, 1952, by the Weevil-Cide Company, Kansas City, Mo. Claims use since about June 16, 1952.

DRAWING OF A FOUNTAIN spouting water, for insecticide, fungicide, parasiticide and stock dip. Filed Dec. 17, 1951, by N. V. Chemische Industrie "Rids," Haarlem, Netherlands. Claims ownership of Dutch registration No. 76,131, dated Mar. 20, 1941

FERBERK, in Italic capital letters set diagonally across circular background, for fungicides for control of various plant diseases. Filed Dec. 28, 1951, by F. W. Berk & Co., Inc., Woodridge, N. J. Claims use since Sept. 1, 1951.

TRONA, in capital letters with box and oval backgrounds, for muriate of potash, potash salts, sulfate of potash and other minerals. Filed May 10, 1952, by American Potash & Chemical Corp., New Corp., New York. Claims use since Dec. 1, 1927.

HL-636, in heavy letters, for insecticides. Filed Nov. 4, 1952, by California Spray -Chemical Corp., Richmond, Calif. Claims use since Sept. 10, 1952.

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Horsfall, Cyanamid, Retires

Dr. John L. Horsfall, early pioneer in the field of industrial entomology, has retired from his post as American Cyanamid Company's chief entomologist. His thirty-seven year career in the field of entomology began with summer research work at Iowa State Agricultural College, Ames, from 1916 to 1919. During the same period he was studying for his doctorate at the State University of Iowa, Iowa City.

From 1920 to 1925 he was associate professor of entomology at Pennsylvania State College, and for the next year was employed by Cyanamid as an entomologist. From 1926 to 1928 he conducted entomological research for Bayer Company, and returned to Cyanamid in 1928. He was nmed chief entomologist in 1944.

During his work with Cyanamid he played a key role in developing parathion and malathon, two of the firm's principal insecticides. He is prominent in American entomology and it is understood that he may accept a position as consultant for another insecticide firm, although confirmation of details was lacking as this issue went on the press.

•

International Conf. for Oct.

The first International Congress for Plant Protection will be held in Naples, Italy, October 19 to 23. This group has been formed by the International Confederation of Technical Agriculturists and the International Centre for Plant Protection. Taking part in the Congress will be representatives of Governments and principal world organizations and delegates from similar institutions; delegates from technical, scientific and cultural institutions dealing with agricultural chemistry, agronomy and plant protection; and delegates from industrial associations or firms manufacturing chemical means for plant protection or machinery and apparatus connected with the industry.

Site of the meeting will be the Agricultural College of the University of Naples at Portici. The meeting wil close October 23 in the Congress House at the International Agricultural Exhibition, Rome. Further information regarding admissions and costs should be addressed to the General Secretariate of the Congress for Plant Protection, Via Barberini 86, Roma, Italy. Travel information is available through Thos. Cook & Son, which have been appointed official agents for the Congress.

•

Purcell To Head Own Firm

John W. Purcell has resigned from S. B. Penick & Co. in order to devote full time to the firm of Plant Cultures, Gainesville, Fla. Mr. Purcell is president of this company which produces nitrogen-fixing bacteria. (Legume inoculation) In addition to his activities with Plant Cultures, he will also represent a number of manufacturers of agricultural chemicals in the southeast as a manufacturers' representative.

Before his association with the Penick organization, Mr. Purcell was with Prentiss Drug & Chemical Co. for 16 years, where he held the post of vice-president. He is well known in the southeastern area where he has been engaged in agricultural chemical sales for the past 30 years.

•

Isotopes Subject of Report

The National Industrial Conference Board, 247 Park Ave., New York 17, N. Y., has released a transcript containing articles by thirty leaders in the atomic energy field. Among authors discussing the use of food processing was Sterling B. Hendricks, head chemist, Division of Soil Management and Irrigation Agriculture, U. S. Department of Agriculture, Washington, D. C.

Brea, California, Ammonia Plant Under Way

Construction of a $13,000,000 ammonia plant at Brea, Orange County, California, for lease to Brea Chemicals, Inc. is under way, it has been announced by Homer Reed, president. Architect's drawing shows general layout of the plant.

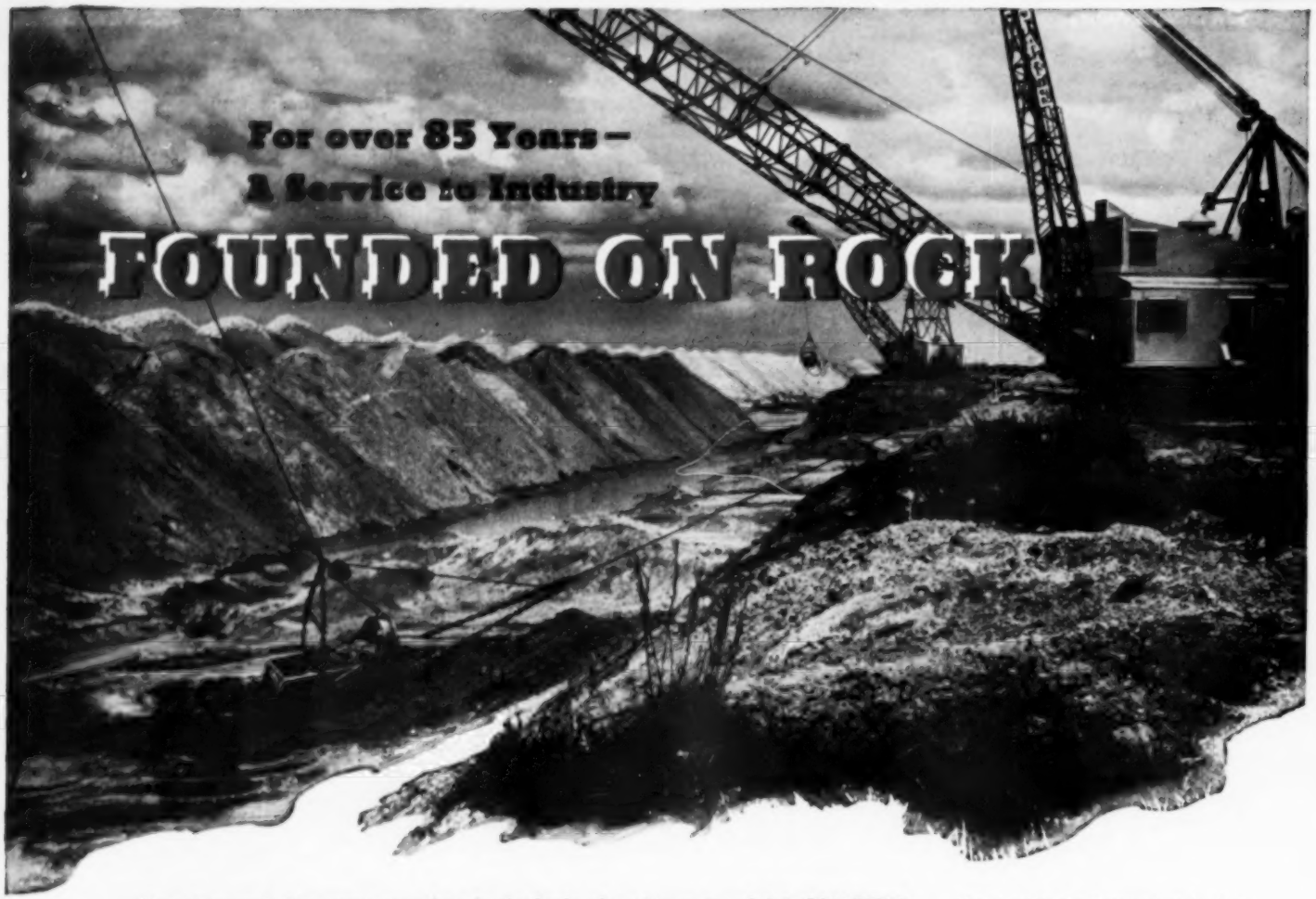
Brea Chemicals, Inc. is a wholly-owned subsidiary of Union Oil Company of California. The plant is being built and financed by Ammoniaco Corporation, a non-affiliated company, on a 30-acre site two miles east of Brea.

It will incorporate many new engineering features and use a special process to produce over 200 tons a day of ammonia for western agriculture and industry. Raw material will be natural gas from nearby wells. Emphasis is being placed on appearance through landscaping and building design.

When it opens in May, 1954, the plant will have an annual payroll in excess of $750,000.

C. F. Braun & Co. will construct the facility for Amoniaco. The administration buildings were designed by Austin, Field and Fry.

The lower photo shows the administration building for the new ammonia plant.



Phosphate rock from our own mines is the basis of a wide range of AA QUALITY products . . . a service to industry founded on rock. Ample rock reserves and our own production of Elemental Phosphorus 99.9% pure assure a dependable source of supply. Rigid control of all stages of production, from mines to finished product, means utmost purity and uniformity. Highest quality, security of supply, prompt service—good reasons for buying and specifying AA QUALITY products. Glance through the product list, below—write for full information.

Mining pebble phosphate rock at A. A. C. Co. mines, Pierce, Florida.

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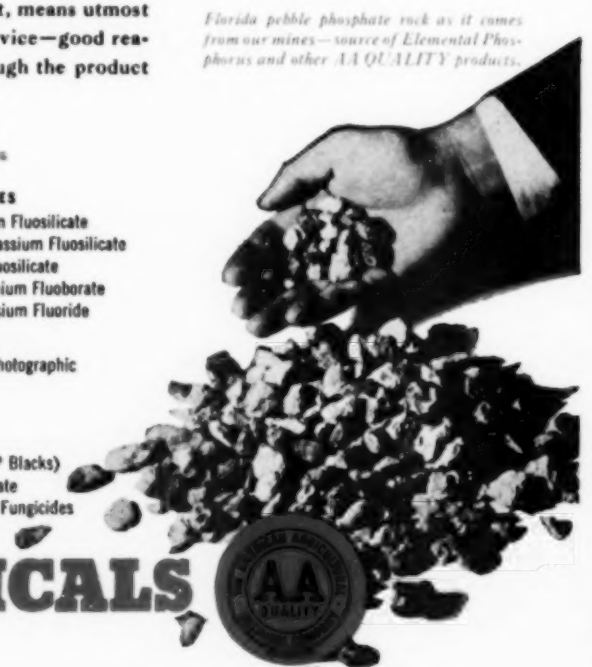

AA QUALITY Phosphorus Products

PHOSPHORUS AND PHOSPHORUS COMPOUNDS
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Phosphorus Red (Amorphous)
Phosphorus Pentasulphide • Sesquisulphide
Ferro Phosphorus (Iron Phosphide)

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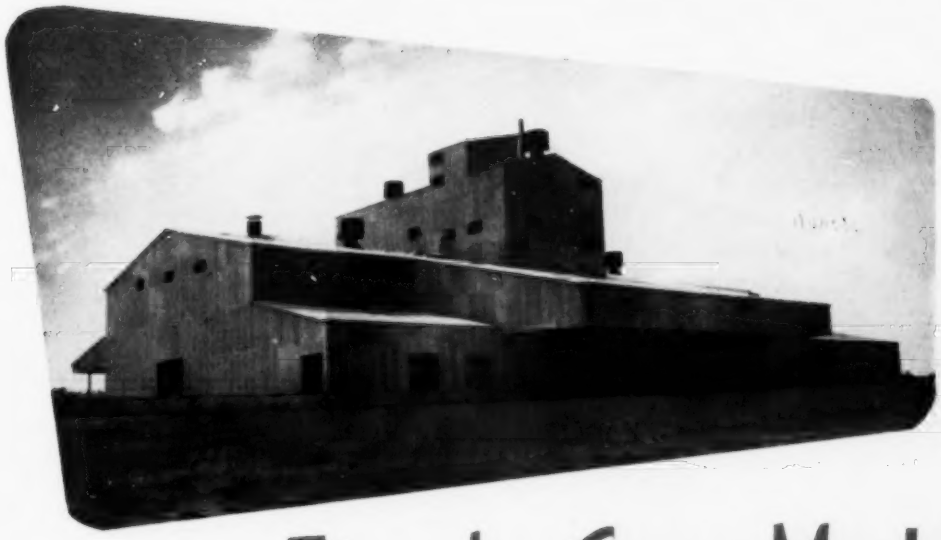

Florida Goes Modern

To better serve its ever growing family of farmer-customers with plant foods of premium quality, the NACO FERTILIZER COMPANY selected the Sackett organization to design, construct and equip this new highly-mechanized fertilizer mixing plant at Fort Pierce, Florida.

This new facility is, to our knowledge, the first plant of its kind ever to be **custom-engineered* throughout to meet the complex manufacturing problems due to Florida's required multiplicity of grades.

Superphosphate and mixed goods producers are invited to get our seasoned counsel on their expansion and modernization programs. It is available at no cost.

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SUPERPHOSPHATE PLANTS · FERTILIZER MIXING PLANTS

RELATED PRODUCTION EQUIPMENT

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1717 S. HIGHLAND AVENUE, BALTIMORE 24, MD.

Architects and Manufacturing Engineers to the Fertilizer Industry since 1897

New Agricultural Chemicals Helping American Farmers

PARATHION Originally developed by Farbenfabriken Bayer and now manufactured in this country by Chemagro Corporation, parathion is an insecticide of established effectiveness and constantly widening use.

SYSTOX* Common name of active ingredient: demeton. A systemic insecticide, revolutionary in its mode of action. Highly effective against sucking plant pests such as aphids and mites. Used commercially with outstanding success on cotton and in widespread tests on various other crops in 1952. The potential usage and economic importance of SYSTOX appear very large.

NITROX* Common name of active ingredient: methyl parathion. NITROX appears effective against bollweevil, aphids, mites and thrips on cotton. In combination with DDT protection against bollworm and pink bollworm is also indicated. No other insecticide appears to offer protection against so wide a range of cotton insects.

METACIDE* A mixture of parathion and methyl parathion in a special emulsifier which has the property of reducing the skin toxicity of the liquid concentrate. Highly effective against a wide range of insects on many crops.

* REGISTERED TRADEMARK OF CHEMAGRO CORPORATION

CHEMAGRO CORPORATION

350 FIFTH AVENUE, NEW YORK 1, N.Y.

CORONA CHEMICAL DIVISION

PITTSBURGH PLATE GLASS COMPANY

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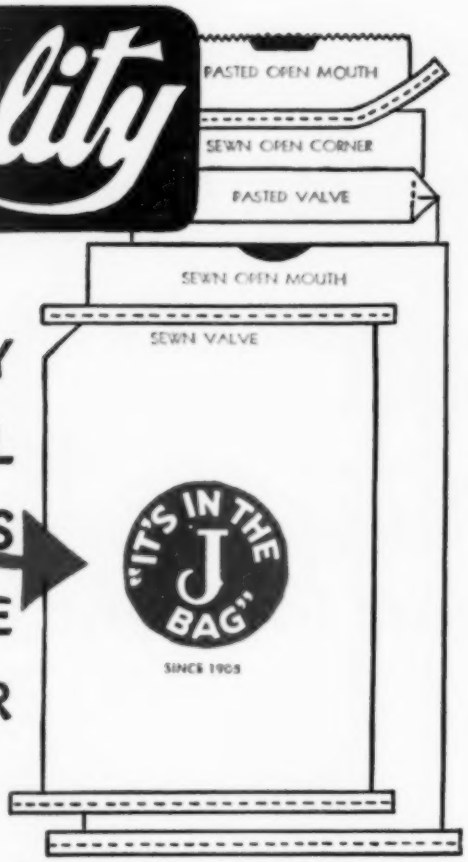
Jaite Quality



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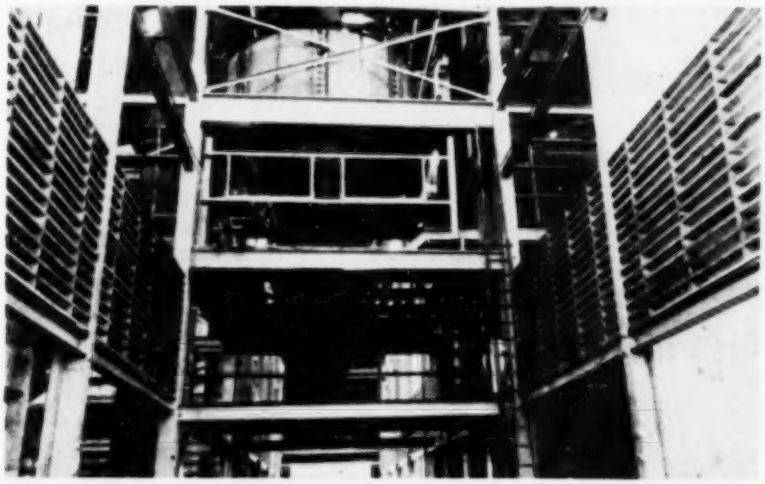
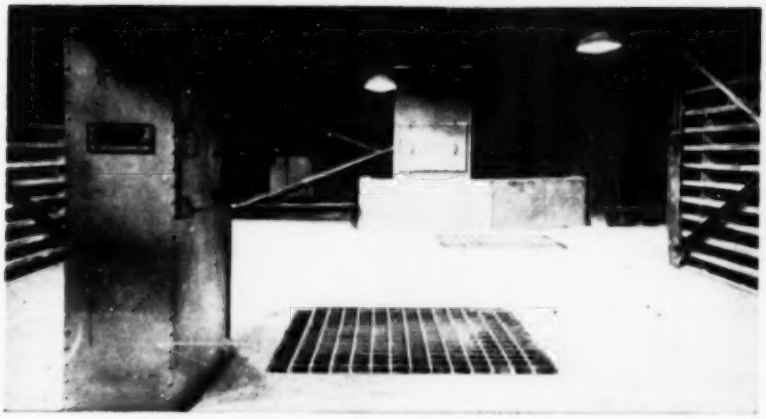
Indiana Plant Opens With New Equipment





Kingsbury & Company, Indianapolis, one of the oldest-established fertilizer manufacturers in the midwest, has recently opened a new modern fertilizer mixing plant at Peru, Indiana, to replace one destroyed by fire last year.

Two scenes in the new plant are pictured (left). The entire plant was designed, constructed and equipped by A. J. Sackett & Sons Co., Baltimore, Md. Sackett, which has served the fertilizer industry for more than a half-century, points out that the Kingsbury plant and its equipment were custom-engineered to meet Kingsbury's specific problems of production and shipping. Included in the installation are modern bulk receiving and distributing facilities, recording type manufacturing and continuous ammoniating.

EDITORIAL

(*Continued from Page 33*)

appealed. And, incidentally, it is a case which is of just as direct concern to the balance of the industry as it is to the particular company whose product has been singled out in this specific action. Already, we learn, this recent decision is being cited as a precedent in other pending cases. Unless it is reversed by subsequent appeal to a higher court, which might very logically be supported by the entire agricultural insecticide industry, it will serve as a continuing hazard to every firm selling pesticides.

INDUSTRY MEETING CALENDAR

Del-Mar-Va Penninsula Fertilizer Conference, George Washington Hotel, Ocean City, Maryland, June 27.

South Carolina Fertilizer Meeting, Pee Dee Experiment Station, Florence, S. C., July 16, 1953.

Ohio Pesticide Tour, Ohio Agricultural Experiment Station, Wooster, August 12 to 14.

Connecticut Agricultural Experiment Station Annual Field Day, Experimental Farm, Mt. Carmel, Conn., August 19.

American Phytopathological Society (In connection with American Institute of Biological Sciences), University of Wisconsin, Madison, September 6-10.

American Chemical Society, Fall Meeting, Conrad Hilton Hotel, Chicago, Ill., September 6-11.

Twentieth Annual Fall Meeting, National Agricultural Chemicals Association, Essex and Sussex Hotel, Spring Lake, N. J., September 9, 10 & 11.

Association of Official Agricultural Chemists, Shoreham Hotel, Washington, D. C., October 12, 13 & 14.

Association of American Feed Control Officials, Shoreham Hotel, Washington, D. C., October 14 & 15.

Association of American Fertilizer Control Officials, Shoreham Hotel, Washington, D. C., October 16.

Association of Economic Poisons Control Officials, Shoreham Hotel, Washington, D. C., October 17.

First International Congress for Plant - Protection, University of Naples, Portici, October 19-23.

Fertilizer Safety Section, National Safety Council, Chicago, Ill., October 21.

Second Annual Meeting of the Entomological Society of Canada jointly with the Entomological Society of Quebec, Quebec City, Oct. 29-31.

Thirtieth Annual Convention, California Fertilizer Association, Carmel-By-The-Sea, Calif., November 9 & 10.

Sixth Annual Pesticide Application Equipment Conference jointly with 15 th Annual New York State Insecticide-Fungicide Conference, Bibbins Hall, GLF, Ithaca, N. Y., November 10-12.

Entomological Society of America, Biltmore Hotel, Los Angeles, Calif., December 7-10.

Illinois Custom Spray Operators' Training School, University of Illinois, Urbana, January 21-22, 1954.

Pesticides-Residue Amendment

To the Federal Food, Drug, and Cosmetic Act

H. R. 4277 and S.1542

What it means to the Farmer

If the amendment is adopted it would:

- **Give assurance to the farmer that if the directions on pesticide labels are followed properly his produce, sold in interstate commerce, would not be subject to seizure due to pesticidal residues.**
- **Give the farmer more chemical tools to control pests by encouraging research and speeding up the introduction of new pesticides.**
- **Allow the continued issuance of spraying and dusting recommendations by land grant colleges on a more specific basis — a situation which is somewhat in jeopardy under the present law.**

We believe the adoption of this amendment will stimulate research by symplifying procedures for the introduction of efficacious, new products. For detailed information write to the Executive Secretary:

NATIONAL AGRICULTURAL CHEMICALS ASSOCIATION

910 SEVENTEENTH STREET, N. W. WASHINGTON 6, D. C.

Motomco Offers "Pival"

"Pival", a new anti-coagulant rodenticide with insecticidal and fungicidal properties, has just been released for general sale following a year of testing under an experimental permit of the Production and Marketing Administration of the U. S. Department of Agriculture. The announcement was made by Motomco, Inc., New York — chemical specialty manufacturers and licensees and sole producers of "Pival". Motomco will offer the product in a .5% concentrate for professional use to pest control operators and sanitarians and to packagers of "Pival" baits for agricultural, industrial and municipal markets.

The active ingredient of "Pival" is 2-Pivalyl-1,3-Indandione. Used in cereal baits at a concentration of 1 part in 4,000, its action depends on continued eating over a period of several days. Tasteless and odorless, it is said to create no "bait shyness" in rats and mice. The product is reported to impart to cereal baits resistance to both insect infestation and mold. "Pival" is claimed by Motomco as the only anti-coagulant rodenticide providing this protection to the bait.

A test project is now under way in cooperation with the U. S. Fish and Wildlife Service towards the development of a water soluble form of "Pival" which promises specialized protection against rodent contamination in grain storage.

•

John-Manville Anniversary

Johns-Manville Corp. on May 13 & 14 observed the 60th anniversary of the first commercial shipment of diatomite from its site in Lompoc, Calif. Open house for the public and a barbeque for employees comprised part of the program.

On hand for the occasion were J-M officials, including A. R. Fisher, president; Arthur S. Elsenbast, vice-president and general manager of the Celite Division; and O. B. Westmont, manager of the Lompic plant.

In connection with the anniversary, J-M has published a booklet, "Celite" describing in detail the origin, production and applications of the diatomite. It is well illustrated throughout its 28 pages.

Celite is used in both the fertilizer and pesticide trades, as well in dozens of other applications. Write for copies of the booklet, "Celite", to Johns-Manville, Box 60, New York 16, N. Y.

•

New Urea Synthesis Process

Mr. E. D. Powers, president of Chemical Construction Corporation, has revealed details of a new urea synthesis process developed by his firm and now used in a plant designed for Sumitomo Company in Japan.

It is a complete recycle process permitting 76% conversion of ammonium carbamate to urea per pass, nearly twice that of other processes now available commercially. Excess ammonia is separated from the autoclave product as a gas, condensed without compression, and recycled by pumping. Nonconverted carbamate is decomposed and the ammonia-carbon dioxide gas mixture obtained therefrom is separated to recover ammonia gas for recycle. The overall ammonia efficiency is said to be 97%.

Mr. Powers, also vice-president and director of the parent firm, American Cyanamid Company, said that economies of the process include: 70% more urea produced per pass at no increase in power consumption over that of other processes; minimum corrosion; simple and efficient recirculation of ammonia; and the ammonia recovery involves only about one-half the amount of carbamate as compared with other processes.

The equipment designed for the new process includes a new granulator with a special spraying device that permits the production of uniform spherical pellets with only minor recirculation of off-size product.

FERTILIZER USE

(*Continued from Page 46*)

the general trend in the change in composition of mixed fertilizers during the past years. In 1943-44 (3), the average nutrient content of all mixed fertilizers was 20.84 percent, comprising 3.71 for nitrogen, 10.38 for available P_2O_5, and 6.75 percent for K_2O. In this survey the values for these nutrient contents were, nitrogen 4.30, available P_2O_5 11.14, and K_2O 9.42, a total of 24.86 percent. These respective nutrients were 15.9, 7.3, 39.6, and the total 19.3 percent greater than in 1943-44.

Materials

PRINCIPAL materials consumed in the agriculture of each State are shown in Table 4, while in Table 5, the various kinds of fertilizers so consumed are shown for each region. Quantities of materials used in the manufacture of mixtures are not included.

A slight change was made in these tables from those of former years. The quantities of secondary and minor element materials were taken out of the totals (Table 4) and are shown separately for each of the States. In Table 5, though shown separately, they are included in the grand totals for each of the regions. This has been done to show more clearly the trends in consumption of materials that contain only the primary plant nutrients.

The classes of materials consumed were, in order of their proportions, phosphates 3,314,156 tons (45.1 percent); chemical nitrogen materials 2,582,924 tons (35.1 percent); secondary and minor element materials 785,050 tons (10.7 percent); natural organics 343,815 tons (4.7 percent); and potassium materials 320,124 tons (4.4 percent).

The principal net changes in consumption from 1950-51 in chemical nitrogen materials were the increases in anhydrous ammonia (42.1 percent), ammonium nitrate — limestone mixtures (33.8 percent), and ammonium nitrate (25.2 percent) while calcium cyanamide decreased 34.2 percent. Consumption of normal and concentrated superphosphates was 20.2 and 6.1 percent less than in 1950-51, respectively. Consumption of the other phosphate materials was

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lower than in 1950-51 in about one-half of the States while their use was greater in the remaining States. A net increase in consumption approximating 5 percent resulted.

Consumption of the principal potassium materials, potassium chloride, 50 and 60 percent grades, and potassium sulfate, were 10.8, 56.6, and 9.2 percent greater than in 1950-51, respectively. In comparison with changes in other regions, the rate of increase for chemical nitrogen materials was highest in the East North Central region; for natural organics and phosphates, in the Mountain region; and for potassium materials in the West North Central region.

Table 6. - Consumption of Primary Plant Nutrients in Fertilizers, Year Ended June 30, 1952[1/]

Tons

State & Region	In Mixtures					In All Fertilizers				
	Nitrogen	P_2O_5		K_2O	Avail. P_2O_5 & K_2O	Nitrogen	P_2O_5		K_2O	Avail. P_2O_5 & K_2O
		Available	Total				Available[2/]	Total[3/]		
Maine	12,206	21,681	22,866	24,917	59,803	17,804	23,342	24,263	25,954	62,100
New Hampshire	561	1,429	1,734	2,109	4,293	793	2,586	2,735	2,155	5,434
Vermont	1,035	5,138	5,376	5,803	12,026	1,136	8,679	9,030	8,036	18,900
Massachusetts	3,561	7,077	7,406	7,744	18,492	4,649	8,745	9,214	8,059	21,493
Rhode Island	716	1,443	1,528	1,482	3,511	876	1,647	1,743	1,506	4,029
Connecticut	3,138	5,064	5,781	5,584	13,756	4,575	7,239	8,080	6,929	18,740
New England	21,316	42,082	44,391	48,579	111,977	24,983	52,138	55,067	50,565	127,666
New York	25,184	55,085	57,543	41,607	121,976	30,360	79,299	82,960	42,129	181,777
New Jersey	11,834	25,906	27,094	23,224	60,566	14,123	27,611	29,035	24,119	65,360
Pennsylvania	22,614	89,562	72,256	51,699	143,875	25,299	85,036	89,222	52,915	163,213
Delaware	3,046	6,150	6,499	7,506	16,741	3,771	6,561	6,984	7,612	19,944
District of Columbia	89	179	182	114	382	125	243	249	124	492
Maryland	10,117	30,771	32,715	23,014	63,902	12,112	36,002	37,039	23,134	69,282
West Virginia	2,014	9,697	10,416	6,901	19,512	2,512	14,827	15,801	6,913	24,284
Middle Atlantic	74,937	199,252	208,705	154,065	426,254	88,302	249,629	263,270	156,549	494,780
Virginia	21,687	83,335	88,923	69,380	174,402	33,687	93,422	99,212	71,308	198,617
North Carolina	57,378	154,849	166,378	125,642	337,869	109,161	163,434	178,723	131,185	408,780
South Carolina	26,757	71,346	76,626	56,921	155,024	41,157	81,422	87,485	68,924	211,803
Georgia	42,656	93,206	101,177	81,064	214,726	74,610	102,556	111,627	88,793	266,189
Florida	48,023	69,989	84,862	72,421	190,433	87,233	74,033	94,500	77,701	208,967
South Atlantic	196,401	472,525	517,865	405,428	1,074,354	335,948	515,167	566,547	439,911	1,291,026
Ohio	31,459	121,544	130,348	113,839	266,542	39,131	127,369	139,164	114,096	280,698
Indiana	30,485	116,931	125,143	122,920	270,306	53,046	123,274	144,284	125,908	302,226
Illinois	22,360	71,896	77,062	80,682	179,138	43,871	104,526	297,089	113,134	266,331
Michigan	16,793	71,638	76,310	64,319	152,750	22,822	76,919	82,849	64,708	164,149
Wisconsin	9,954	50,336	53,470	55,341	115,601	13,535	54,331	62,688	56,809	124,674
East North Central	111,021	432,345	462,333	436,971	980,317	171,908	486,419	726,084	474,654	1,137,978
Minnesota	6,539	33,795	35,346	23,958	64,292	10,632	45,453	49,405	24,009	80,084
Iowa	12,916	44,833	47,004	22,564	80,313	29,906	64,185	74,081	24,111	117,102
Missouri	20,951	63,784	68,911	42,066	126,901	41,384	79,271	150,289	48,760	169,915
North Dakota	1,080	5,563	5,686	1,560	8,203	1,358	9,218	9,790	1,960	12,421
South Dakota	372	1,096	1,232	146	1,614	908	2,072	2,372	150	3,126
Nebraska	3,365	6,239	7,086	449	10,853	16,916	14,124	19,042	456	31,494
Kansas	6,600	17,029	18,014	2,790	26,419	21,636	36,950	46,020	2,946	63,232
West North Central	51,823	172,939	183,279	93,533	318,296	122,036	251,271	345,949	102,084	477,391
Kentucky	17,092	52,654	57,364	42,825	111,271	29,800	72,406	84,302	49,322	151,838
Tennessee	16,925	49,102	53,074	39,606	105,633	40,348	64,863	69,182	47,973	152,471
Alabama	36,006	87,236	94,104	66,252	185,493	78,753	120,521	131,703	75,064	274,338
Mississippi	20,574	35,625	38,373	25,402	81,661	101,361	60,656	67,191	41,838	203,886
East South Central	90,596	224,617	242,915	173,845	489,180	250,259	318,136	352,136	214,207	782,602
Arkansas	9,367	19,412	20,604	21,288	60,067	38,578	33,214	35,636	29,698	101,490
Louisiana	10,278	20,094	21,432	14,682	48,054	42,842	28,670	31,720	19,088	90,870
Oklahoma	3,431	7,965	8,406	3,767	15,163	7,712	20,960	33,819	5,757	34,329
Texas	14,272	35,666	37,688	19,449	69,407	50,789	82,974	94,842	20,439	184,202
West South Central	37,348	83,187	88,330	59,186	179,691	139,921	165,716	196,014	74,982	380,591
Montana	303	651	722	46	1,000	2,262	5,967	6,428	51	8,260
Idaho	1,306	1,867	1,715	166	3,037	6,937	12,617	13,204	200	19,854
Wyoming	63	120	128	19	202	224	2,162	2,744	19	2,409
Colorado	1,695	4,052	4,176	1,155	7,202	6,354	10,389	10,625	1,257	17,960
New Mexico	139	258	265	45	442	2,068	4,951	5,063	49	7,068
Arizona	2,754	3,437	3,618	442	6,633	25,030	11,804	11,918	572	37,206
Utah	229	450	473	80	759	4,250	3,769	3,951	236	8,254
Nevada	48	77	81	27	157	194	893	688	27	814
Mountain	6,736	10,612	11,181	1,979	19,427	47,340	51,922	54,665	2,390	101,612
Washington	1,823	3,270	3,610	2,726	7,819	15,615	9,218	10,318	3,764	28,794
Oregon	1,653	2,920	3,126	1,629	6,401	17,210	11,295	12,173	2,648	31,193
California	21,852	20,129	21,586	11,588	53,569	152,742	67,030	70,174	18,274	238,040
Pacific	25,328	26,319	28,322	16,143	67,790	185,807	87,540	92,665	24,686	298,033
Continental U. S.	615,606	1,663,848	1,787,321	1,389,729	3,669,183	1,366,401	2,179,940	2,688,796	1,845,398	5,091,739
Hawaii	5,715	4,744	5,120	9,096	19,580	16,930	7,170	8,074	14,406	30,508
Puerto Rico	26,892	12,094	14,063	21,558	60,544	41,384	12,144	14,113	21,616	75,144
Alaska	10	19	19	15	41	65	122	124	49	236
Territories	32,617	16,857	19,202	30,666	80,140	58,379	19,436	22,311	36,069	113,884
Total: 1951-52	648,223	1,680,705	1,806,523	1,420,395	3,749,323	1,424,780	2,199,376	2,678,070	1,881,467	5,205,623
1950-51[4/]	583,959	1,541,863	1,657,425	1,254,927	3,380,749	1,236,977	2,109,900	2,536,988	1,379,815	4,726,690
1949-50	495,360	1,344,296	1,446,118	1,018,174	2,807,829	1,005,452	1,949,768	2,290,061	1,103,062	4,068,282

1/ Includes Government distribution.
2/ Includes, as available P_2O_5, 2 percent of the colloidal phosphate and 3 percent of the phosphate rock marketed for direct application.
3/ Includes, as total P_2O_5, 22 percent of the colloidal phosphate and 32 percent of the phosphate rock marketed for direct application.
4/ Revised.

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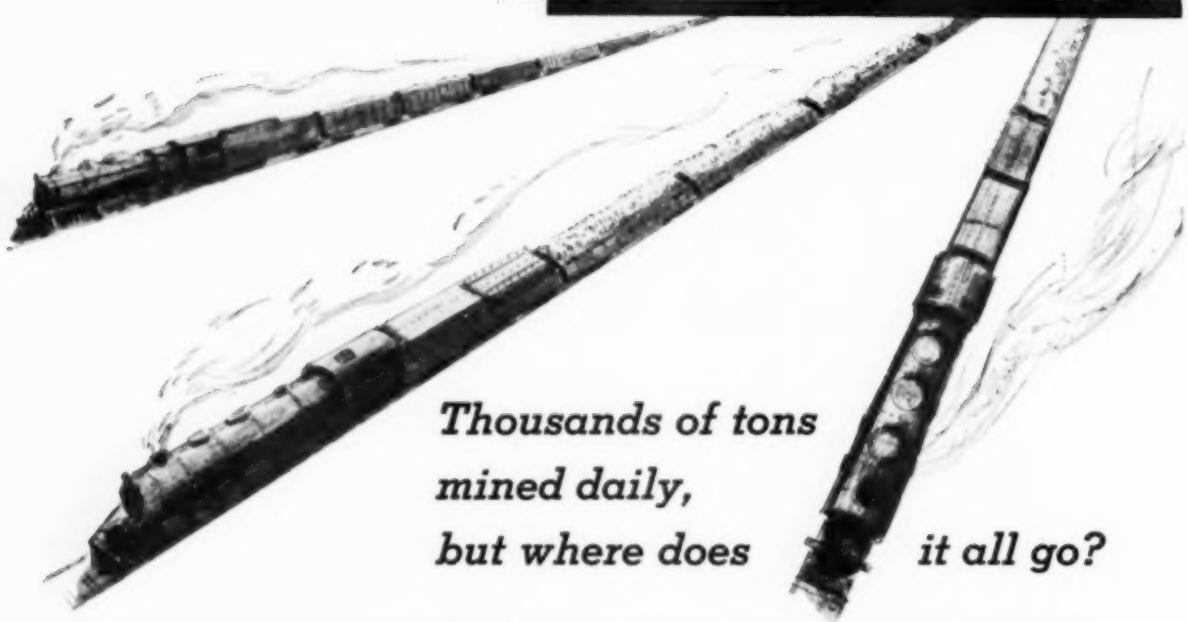

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Decreases in consumption occurred in some regions. The highest decrease in chemical nitrogen materials was in the Territories; for natural organics, in the South Atlantic region; and for phosphate and potassium materials, in the New England region.

The weighted average content of primary nutrients in materials is given, for the first time, by States, in Table 7. These averages are based on the composition and amount consumed, in the State, of the individual materials coming within the class. The data show the average quality of the materials composing the class that are used for direct application in the agriculture of each State. The national average, in percent, for materials that contain only nitrogen was 28.06, those containing only P_2O_5 14.71 (available P_2O_5); only K_2O, 49.98; and those having more than one nutrient 20.97.

Primary Plant Nutrients

CONSUMPTION of primary plant nutrients, by States is shown in Table 6, while Figure 2, shows the total tonnage consumed in each region in comparison with consumption in 1950-51. These values are based on the amounts of fertilizers reported herein and their average analysis as found by the fertilizer control officials of the respective state in which these fertilizers were consumed.

The national consumption of primary nutrients during the year ended June 30, 1952, was nitrogen 1,424,780; available P_2O_5, 2,199,376; (total P_2O_5 2,678,070); and K_2O, 1,581,467 tons. These quantities represented net increases over 1950-51 in nitrogen of 187,803 tons, available P_2O_5 89,476 tons, (total P_2O_5 141,082 tons), and K_2O 201,654 tons. Consumption of primary nutrients was, therefore, 15.2, 4.2, (5.6), and 14.6 percent greater than in 1950-51, respectively.

The amounts and proportions of the total quantity of nutrients consumed through mixed fertilizers were 648,223 tons or 45.5 percent of the nitrogen, 1,680,705 tons (76.4 percent) of the available P_2O_5, 1,806,523 tons (67.4 percent) of the total P_2O_5, and 1,420,395 tons (89.8 percent) of the K_2O. In 1951-52, the amounts consumed in mixed fertilizers were for nitrogen 11.0, available P_2O_5 9.0, total P_2O_5 9.0, and K_2O 13.2 percent greater than in 1950-51.

While the amounts of nutrients consumed in materials were 18.9 and 29.0 percent greater for nitrogen and K_2O, respectively, they were 8.7 and 0.9 percent less, for available P_2O_5 and total P_2O_5, respectively, than in 1950-51. Total primary nutrients consumed in 1950-51 and in 1951-52 were 4,726,690 tons and 5,205,623 tons, respectively, a net increase of 478,933 tons or 10.1 percent in comparison with the increase of 6.4 percent for tonnage of fertilizers containing these nutrients.

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Table 7. - Weighted Average Content of Primary Plant Nutrients in Fertilizers, in Percent, Year Ended June 30, 1952[1]

State & Region	Mixtures[2]				Materials					Total Nutrients in Mixtures and Materials
					Single Nutrient[3]			Multiple Nutrients[4]		
	N	Available P_2O_5	K_2O	Total Nutrients	N	Available P_2O_5[5]	K_2O		Total Nutrients	
Maine	4.06	10.74	11.94	29.68	29.25	19.95	50.52	10.73	20.10	29.22
New Hampshire	3.70	10.75	13.92	28.37	29.99	20.72	51.18	9.26	21.52	28.43
Vermont	2.69	13.42	10.04	31.15	30.19	20.59	50.34	12.94	21.61	28.16
Massachusetts	4.93	9.55	10.43	24.89	33.94	19.92	50.20	10.01	16.91	23.35
Rhode Island	4.99	10.06	10.13	25.17	16.70	19.87	51.76	11.41	17.94	24.09
Connecticut	5.36	8.65	9.49	23.50	30.62	20.32	52.27	11.56	17.93	23.70
New England	3.30	10.46	12.07	27.33	23.53	20.27	54.02	10.22	19.11	26.85
New York	3.19	11.32	8.85	23.09	24.31	20.20	57.95	10.15	20.24	23.60
New Jersey	4.81	10.71	9.84	25.26	23.10	19.95	50.50	10.56	20.99	24.96
Pennsylvania	3.99	12.25	9.10	26.35	23.53	20.02	54.16	10.92	20.15	24.50
Delaware	4.15	11.00	10.15	25.29	25.97	19.89	51.23	9.36	19.49	24.84
District of Columbia	5.14	10.34	6.89	22.37	16.26	20.75	52.60	12.24	13.98	19.36
Maryland	3.78	11.51	8.61	23.90	22.73	19.83	54.32	14.97	18.84	23.34
West Virginia	2.75	13.28	9.44	25.45	20.19	21.35	53.33	10.34	21.09	24.69
Middle Atlantic	4.38	11.66	9.00	25.28	23.69	19.94	49.63	10.65	20.12	24.23
Virginia	2.93	11.27	9.38	23.58	19.77	23.57	51.31	26.36	20.11	23.09
North Carolina	3.65	9.84	8.00	21.49	19.16	18.72	51.33	11.10	19.90	21.21
South Carolina	3.72	9.99	7.98	21.67	19.85	17.14	48.92	34.72	21.97	21.46
Georgia	4.04	8.81	7.70	20.59	20.84	16.64	49.38	19.74	21.10	20.68
Florida	4.83	7.19	7.44	19.56	21.19	20.04	54.18	22.39	19.31	19.84
South Atlantic	3.88	9.33	8.08	21.55	19.80	17.04	57.38	22.44	20.62	21.14
Ohio	3.20	12.38	11.84	27.10	27.97	17.91	50.93	10.07	21.29	26.76
Indiana	3.36	12.12	11.16	26.94	29.18	9.80	52.59	9.69	21.42	27.90
Illinois	3.77	12.14	13.66	29.57	31.74	6.53	57.11	10.28	20.83	28.57
Michigan	3.13	13.38	11.99	28.67	26.53	19.30	56.19	9.81	21.13	27.90
Wisconsin	2.84	14.35	14.76	32.95	33.27	10.10	51.45	9.33	21.21	31.68
East North Central	3.27	12.73	12.66	28.66	30.01	8.10	56.49	11.59	13.66	28.00
Minnesota	3.82	10.74	13.98	27.55	32.16	29.01	56.34	24.71	30.16	28.82
Iowa	4.65	14.16	9.12	29.91	31.50	17.85	57.67	30.34	24.69	27.43
Missouri	4.90	14.91	9.83	29.64	36.49	6.63	56.88	20.99	13.26	22.56
North Dakota	6.08	23.90	7.26	36.19	32.74	64.33	--	62.65	63.71	39.91
South Dakota	6.60	19.68	2.58	28.65	31.64	23.59	48.50	52.67	26.76	27.70
Nebraska	10.67	21.48	1.41	33.66	32.66	33.00	60.50	38.16	33.30	32.35
Kansas	7.80	20.13	3.30	31.23	30.63	24.68	59.06	43.56	29.90	30.66
West North Central	5.08	16.95	9.17	31.20	32.62	14.13	57.06	37.26	21.00	27.31
Kentucky	3.64	10.90	8.90	23.24	31.29	21.26	60.35	10.93	26.09	24.05
Tennessee	3.62	11.08	8.93	23.91	30.81	22.92	55.09	17.54	29.65	26.36
Alabama	4.14	10.02	7.61	21.77	23.25	12.22	56.39	25.03	17.98	20.44
Mississippi	5.55	9.60	6.84	22.01	32.46	14.76	71.41	29.07	24.87	24.69
East South Central	4.18	10.36	8.07	22.46	29.08	19.60	53.98	21.08	23.01	23.02
Arkansas	6.98	10.32	11.82	26.62	30.14	23.51	61.51	37.71	30.13	29.29
Louisiana	8.71	11.16	8.18	25.02	35.02	19.76	54.12	29.10	30.29	27.42
Oklahoma	8.28	12.26	6.79	25.32	30.27	13.22	54.66	38.16	17.81	19.99
Texas	6.86	12.16	6.63	25.65	34.17	19.75	49.09	30.73	27.71	25.78
West South Central	8.14	11.66	8.18	24.73	33.72	18.26	53.76	35.42	27.06	25.51
Montana	9.26	19.85	1.41	30.80	27.07	43.36	60.60	34.74	37.31	34.76
Idaho	11.23	13.49	1.42	26.14	24.06	29.76	60.66	39.21	29.01	28.13
Wyoming	9.39	17.82	2.63	30.10	27.68	37.65	--	--	36.72	30.06
Colorado	9.89	12.69	0.71	24.99	26.67	37.97	51.67	26.42	40.41	32.06
New Mexico	9.18	16.97	2.96	29.46	34.28	39.69	60.80	37.18	37.83	37.12
Arizona	11.31	14.18	1.82	27.25	26.68	30.16	60.80	34.87	36.02	34.07
Utah	8.88	17.45	3.10	29.43	23.74	30.67	59.68	33.76	37.13	37.53
Nevada	7.49	12.03	4.21	23.71	24.58	28.68	--	30.22	28.78	27.66
Mountain	10.46	16.27	3.68	29.78	32.81	34.76	60.76	36.38	34.01	33.11
Washington	6.82	12.76	10.80	29.26	40.11	25.35	59.20	24.81	33.66	32.44
Oregon	9.14	14.39	9.01	31.54	28.06	22.10	57.69	36.86	28.60	29.16
California	10.19	9.89	9.41	29.99	32.12	20.61	52.00	13.60	24.27	24.74
Pacific	9.69	10.07	6.18	25.94	32.27	20.74	54.48	15.08	25.69	25.74
Continental U. S.	4.16	11.26	9.36	24.78	27.99	16.71	53.70	20.72	22.02	23.68
Hawaii	10.29	9.04	16.56	35.71	25.25	14.90	56.25	53.90	31.66	33.32
Puerto Rico	12.10	8.44	9.70	27.24	34.93	23.06	56.24	34.00	34.94	29.47
Alaska	8.56	14.24	10.28	33.04	32.25	47.74	60.66	36.34	43.80	41.74
Territories	11.74	6.07	11.04	28.85	30.04	16.69	56.26	45.36	32.99	29.96
U. S. Average:										
1951-52	4.90	11.16	9.62	24.84	28.06	14.71	49.98	20.57	22.90	24.05
1950-51	4.18	11.08	8.98	24.19	--	--	--	--	21.14	23.29
1949-50	4.08	10.93	8.78	23.84	--	--	--	--	21.41	22.67

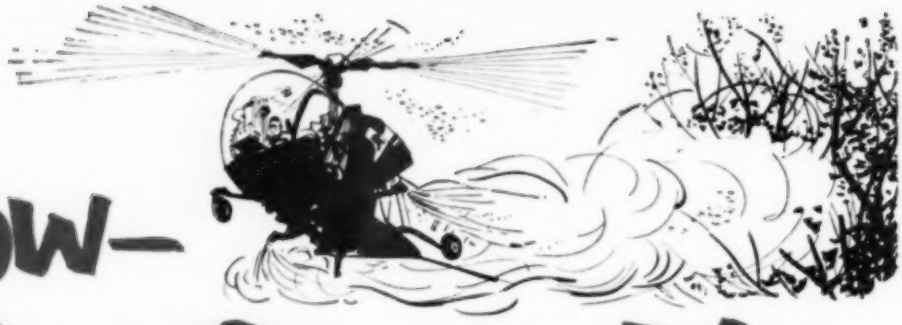
1/ Excludes materials not guaranteed to contain N, P_2O_5, or K_2O.

2/ Guaranteed to contain two or more of the primary plant nutrients, N, P_2O_5, or K_2O.

3/ Guaranteed to contain one of the primary plant nutrients. Includes ammonium nitrate, superphosphate, potassium chloride, etc.

4/ Guaranteed to contain two or more of the primary plant nutrients. Includes potassium nitrate, ammoniated superphosphate, ammonium phosphates, some organic materials, etc.

5/ Includes the available P_2O_5 content of colloidal phosphate and phosphate rock as 2 percent and 3 percent, respectively.



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FOR PESTICIDES, PLANT NUTRIENTS!

New S/V Sovaspray 100

won't injure plants, spreads 25 times better, penetrates plant tissue!

● *S/V Sovaspray 100* represents one of the most important advances to date in the field of agricultural chemicals application. Discovered four years ago, it has since been tested by more than 50 federal and state experimental stations and commercial laboratories. All agencies agree—S/V Sovaspray 100 is the *safest* carrier yet for all oil-soluble chemical insecticides and fungicides, and for plant nutrients and hormones, as well!

What it is

S/V Sovaspray 100 is a low-viscosity, colorless, virtually odorless isoparaffinic oil. *It has extremely low phytotoxicity*—thus can be applied *without injury* to many types of economic crops, ornamentals and shade trees without dilution—*even to the point of run-off.* It has the ability to penetrate plant tissue, can be readily emulsified if desired, is completely compatible with other mineral oils. And it spreads 25 to 50 times better than other hydrocarbon carriers!

Effect on plants, animals

A wide variety of commercial crops, flowers, shrubs and trees has been tested and, without exception, S/V Sovaspray 100 has proved far safer than any other carrier now used. Among the varieties tested were bean, potato, beet, cotton, corn, apple, peach, rose, gardenia, pine, elm, etc.

In tests on animals S/V Sovaspray 100 did not cause systemic toxicity even at high dermal dosage levels.

Its potential applications

As a solvent, vehicle and synergist for oil-soluble insecticides and fungicides.

As a vehicle for pesticides used in low-volume spray equipment, such as planes, helicopters, hand sprays.

As a vehicle for application of nutrients, plant hormones, plant regulators, systemic insecticides and fungicides, defoliants.

As a carrier and penetrant for selected chemical herbicides.

As a diluent, or "safener," to inhibit phytotoxicity of other carriers.

As a carrier for oil-soluble organo-metallic fungicides.

★ ★ ★

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U. S. Fertilizer Manufacturing Setup is Outlined by L. G. Porter

THE fertilizer industry in the United States is a billion dollar enterprise, it is noted in a recent issue of *Plant Food Journal*, published by the American Plant Food Council, Inc., Washington, D. C. This statement was contained in an article, "The Fertilizer Industry in the United States," written by L. G. Porter, chief, Fertilizer Staff, Office of Materials and Facilities, Production and Marketing Administration, U.S.D.A., Washington.

He discusses the production of major primary materials and carries on through the distribution of finished fertilizers in his article. At the end of 1952, he said, some 22 synthetic ammonia plants were in operation, having a combined annual capacity of 1.7 million tons of fixed nitrogen. Approximately 66% of the domestic supply of fertilizer nitrogen came from these plants. In addition, there were 64 by-product plants having an annual capacity of about 180,000 tons of ammonium sulfate, nitrogen content basis, which provided about 11% of the supply. Imports supplied about 21% and the remainder, about 2%, was obtained from organic materials. On an overall basis, Mr. Porter points out, it is estimated that about two-thirds of the National production of fixed nitrogen goes into fertilizers.

Eight producers in Florida accounted for 77% of the phosphate rock production, he reports. Five producers in Tennessee account for 12%; and seven in the Western region for 11%. Some 11½ to 12 million long tons are produced annually now; about 80% of which is used in domestic production of processed phosphatic fertilizers. Six producers in Florida and three producers in Tennessee are reported to be engaged in supplying soft, colloidal and ground phosphate rock for direct application to the soil, he said.

As for sulfur, Mr. Porter reported there were four producers using the Frasch process which accounts for 85 percent of the supply. In general, these deposits are located in the central Gulf Coast area associated with salt domes. Sulfur in the form of so-called recovered material accounted for three percent of the supply; pyrites for six percent; and smelter gases and miscellaneous sources for six percent. On a sulfuric acid basis about 30 percent of the sulfur supply is utilized in the manufacture of fertilizers. Total estimated domestic production of sulfur (equivalent basis) for 1952 was about 6.38 million long tons.

The major consumption of sulfuric acid in the fertilizer field is the manufacture of superphosphates. As of December 31, 1952 there were 207 plants producing normal superphosphates, providing about 77 percent of

- Uniform particle size.
- Uniform ph.
- Water-washed product.
- Purged of all grit.
- Very low viscosity in water at 60% solids without the addition of wetting agents.
- Non-abrasive.

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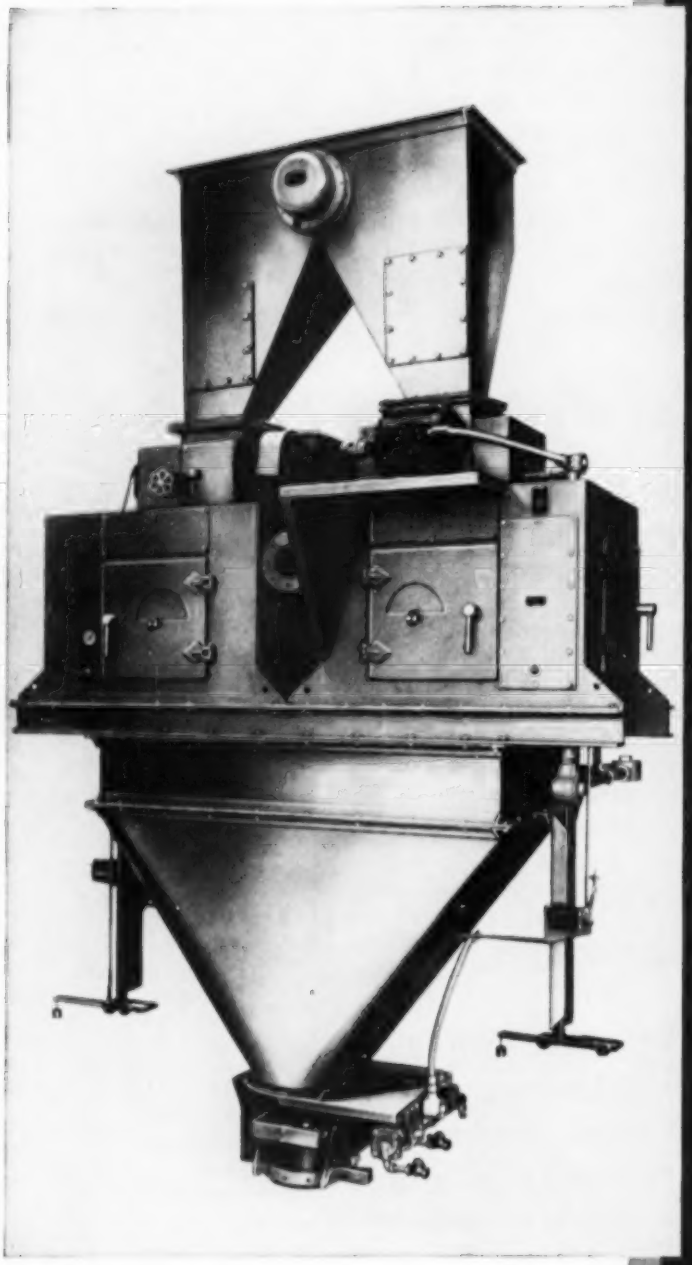

Designed for bagging fertilizers with *speed* up to 20 50-lb. or 80-lb. bags per minute[1]; *accuracy* usually to the split ounce, with a maximum range of 2 to 4 ounces; *savings* to $15 per hour[2] using economical open-mouth bags . . .

...this is the Richardson E-50 Duplex Automatic Bagging Scale...

. . . dust-tight, corrosion-resistant with *stainless steel.* The E-50 is also built in single and triplex units. Bulletin 0552 gives complete specifications—we'll be glad to send you one.

[1] Slightly slower on 100-lb. bags
[2] Cost analysis figures on request

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the total supply. There were six plants which produced concentrated superphosphates exclusively, and six which were associated with plants producing normal superphosphates. The 12 facilities producing concentrated accounted for 16 percent of the total supply; about five percent came from miscellaneous sources, and two percent from imports. Except for a normal disappearance for other purposes, such as feed supplements, practically all superphosphate production is utilized for fertilizer. Production of superphosphates in all forms in 1952 amounted to about 2.19 million tons P_2O_5 basis.

As for Potash the five producers in the Carlsbad, New Mexico, area provided approximately 90 percent of the total supply. One operation in California, one in Utah, and one in Michigan accounted for about three percent, and imports for the remaining seven percent. Domestic production of potash in 1952 was 1.45 million tons, K_2O basis; about 93 percent is used as fertilizer.

When we come to that part of the industry which collects the various primary materials, converts them in part to mixed fertilizers, and distributes these as well as straight materials to farmers, we naturally think of the fertilizer manufacturer as generally identified. Currently it is estimated that there are about 800 establishments (such as companies, firms, partnerships and individuals) of this kind, operating 1,000 or more separate plants.

These facilities are dispersed throughout the country but with the greatest number being located in the Southeast. In common with other industries there is wide variation in annual production, plant by plant, and in volume of sales of individual establishments.

•

Cutworm Control Described

A toxaphene dust or spray is the gardener's best weapon against cutworms, according to U.S.D.A. entomologists. Baits containing toxaphene, sodium fluosilicate, or paris green are effective, but the average gardener may not find them as satisfactory as toxaphene dusts or sprays, it is pointed out in a new USDA publication, "Home and Garden Bulletin 29." Single copies of "Cutworms in the Garden" may be obtained from the Office of Information, U. S. Department of Agriculture, Washington 25, D. C.

The entomologists recommend protection of the early garden from cutworms by dusting the soil surface with 10-percent toxaphene at the rate of one half pound of dust to 1,000 square feet of garden area. If the gardener prefers to use a spray, he can apply one containing two ounces of 40 percent toxaphene wettable powder mixed in two and one half gallons of water over the soil surface, the book says. DDT dusts and wettable powders can be used in the same way. Ready-mixed or self-mixed cutworm baits can be spread by hand over the garden at the rate of one half pound for each 1,000 square feet.

you too can improve your

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COMPOUNDING PLANTS

From base materials to finished product in one complete, compact, Ready-To-Run Unit.

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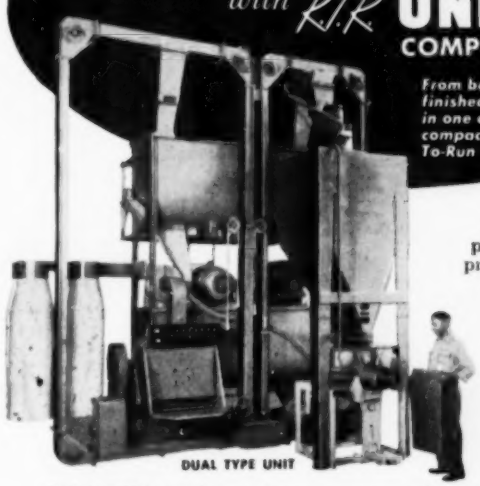


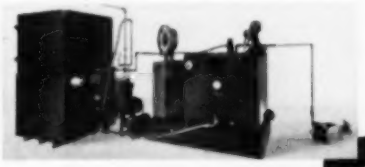
DUAL TYPE UNIT

Many of the largest insecticide producing companies and smaller processors alike have substantially increased production, improved quality and reduced production costs with these factory-tested units. These Ready-To-Run plants mix, blend and package dry, free flowing, powdered materials, including many formulas involving liquid impregnation.

DUAL TYPE: Performs three processes of production: 1) Mixes, blends and packages dry, free-flowing powdered materials. 2) Compounds finished products from ingredients requiring reduction in particle size. 3) Compounds finished products from ingredients involving liquid impregnation.

STANDARD TYPE: Mixes and blends dust concentrates with diluents to produce and package field strength insecticides of consistently uniform superior quality.

Both Dual and Standard Units handle 40 cu. ft. batches



R. T. R. Uni-Blender Liquid Formulating Plants provide for liquefying, blending and injection of specific technical grade toxicants required for the formulation of numerous concentrates and liquid spray chemicals.

Write today for technical bulletins CP-310 and LF-110.

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THE ONLY ANTI-CAKING AGENT MADE ESPECIALLY FOR FERTILIZERS

UDET F

- Speeds up Processing
- Shortens Curing Time
- Makes Bagging Easy

UDET F* has instant water solubility, powerful wetting and penetrating qualities... promotes maximum contact between fertilizer components... sharply reduces time to complete reaction...

UDET F TYPICAL RESULTS

FASTER PRODUCTION	Smoother operation—No gumming or sticking—Saves shutdown time
LOWER MATERIAL COST	Higher absorption rate of N from solution allows the derivation of higher unit N
EASIER HANDLING	Soft pile eliminates blasting: Cuts screening and bagging time by 40 percent
QUICK CURING	3 to 4 days usually sufficient
UNIFORMITY	More uniform particle size and uniform analysis
BAG SETTING	Inhibited
OPERATING PROCEDURE	No change in processing when using UDET F
COST	Low—½ to ¾ pound UDET 90-95F —no more—conditions one ton of fertilizer

*UDET 90-95F — a powder containing 90-95 percent active
*UDET 50F — a free flowing liquid containing 50 percent active

Products using UDET F

- Mixed Fertilizers
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- Borax
- Ammonium Nitrate
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Through the SIFTER...

THE eastern part of the country is currently becoming increasingly aware that 1953 is the big year for 17-year locusts. While there are 17 broods of these pests, so that each year they are emerging somewhere in the eastern half of the United States, this is the year for the largest brood to emerge, which is reported under way,—and in substantial numbers. Little damage of any economic importance is done by the locusts. Chief sufferers are nurserymen and orchardists. But the locusts do tend to make the average householder extremely insect conscious for a spell, and sales of TEPP could very well boom in heavily infested areas. Just to complete this brief salute to our periodic visitor, the 17-year locust, according to those in the know, isn't a locust at all. It's more accurately described as the periodical cicada.

* * *

The NAC board of directors will meet in New York in June. In connection with the meeting they will be guests of American Cyanamid Company for an inspection of Cyanamid's new laboratory, the latest and best of its kind in most every respect, now nearing completion at Stamford, Conn. In addition to being the first major group to be shown through the new lab, the NAC board will be entertained by Cyanamid at a luncheon at the Pickwick Arms, in Greenwich, Conn., followed by golf at the Greenwich Country Club.

* * *

Calumet and Hecla Copper Co., Calumet, Mich., are reported to be going into the manufacture of agriculture fungicides.

* * *

Preparations are under way for the celebration next year of the 100th anniversary of entolomogy. Dave Hall of the information section, BEPQ, USDA, Washington, D. C., is working on a program for publicizing the anniversary. Attention will be directed through various mediums to the important contributions that entomology and economic entomologists have made to the health and food supply of the world.

Two large field trials, comparing fourteen experimental and commercial soil conditioners, are being conducted at the N. J. Agricultural Experiment Station at Rutgers University, New Brunswick, N. J. Under the direction of S. J. Toth, associate professor of soils, the tests will continue for the next two years to compare the longevity of the various materials under study. Anyone in the trade interested in seeing the trials may arrange a visit by communicating with Prof. Toth.

* * *

Incidentally, sales of soil conditioners this season are not exactly setting the world on fire. Producers are studying the reasons. Were these new products announced too soon, before sufficient facts were in to back up the publicity stories? Have they suffered from the "miracle" tag, applied several years ago to DDT with

COPPER SULPHATE

ZINC SULPHATE

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MINERAL SALTS

Minerals are just as essential to healthy plant growth and optimum production of vitamin-rich crops as are nitrogen, potash and phosphate. Mineralized fertilizer stimulates sales and creates new business because the results are conclusive. Fertilizers that give superior results are the fertilizers that the growers buy.

As basic producers of minerals, we would like to discuss mineralized fertilizer with you and show you how to increase your fertilizer tonnage and profits by the addition of minerals.

We can supply mineral mixtures to your own specifications in large or small quantities.

SOLUBLE TRACE MINERALS

Tennessee's trace minerals are soluble and their nutritional value is immediately available to the plant. Soluble trace minerals are more economical and faster acting.

TENNESSEE TRI-BASIC COPPER SULPHATE

COP-O-ZINK

TRI-BASIC Copper Sulphate is a chemically stable copper fungicide containing not less than 53% metallic copper. TRI-BASIC Copper Sulphate can be used as a spray or dust on practically all truck crops and citrus crops. Control persistent fungus diseases—correct copper deficiencies from a nutritional standpoint. Use TC TRI-BASIC Copper Sulphate.

COP-O-ZINK NEUTRAL COPPER-ZINC

TRI-BASIC

COP-O-ZINK is a new, neutral copper-zinc fungicide containing 42% copper and 11% zinc. COP-O-ZINK gives a superior performance in control of fungus diseases. COP-O-ZINK composition of two essential elements gives it added value in correcting deficiencies of zinc and copper, and in stimulating plant growth. COP-O-ZINK is computable with all inorganic and organic insecticides. No lime is required. For use in spraying or dusting.

NU-Z NUTRITIONAL ZINC

NU-Z

NU-Z contains 52% metallic zinc. It is a neutral zinc compound which does not require the addition of lime for direct foliage application. NU-Z gives excellent coverage and adherence to plant foliage, thus rendering it available over a longer period of time. Safe for direct application. For zinc deficiency and plant nutrition—use as a spray or dust.

For detailed information, phone, wire or write—

TENNESSEE CORPORATION

617-29 Grant Building, Atlanta, Georgia

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from

Superphosphates Treated with Nopco* SP-200

The addition of only ¾ to 1-lb. of Nopco SP-200 per ton of superphosphate assures manufacturers of maximum APA content in their superphosphates. At the same time, Nopco SP-200 sharply reduces the curing interval. When added during the acidulation process, it promotes a faster reaction and virtually eliminates caking of the super during storage.

Nopco SP-200 is unique. Because of its extreme stability in high sulphuric acid concentrations, it delivers permanent anti-caking qualities. Thus N-P-K fertilizers produced with superphosphates containing Nopco SP-200 will remain friable and free-flowing—will not cake in the bag during storage or use.

Consider these advantages:

- REDUCED CURING TIME
- INCREASED STORAGE CAPACITY
- HIGHER PRODUCTION RATES
- LOWERED COSTS
- FREE-FLOWING FERTILIZERS—DURING MANUFACTURE, STORAGE, USE

*Reg U.S. Pat. Off.

Let us send you, without the slightest obligation, of course, a generous sample for inspection and testing. Write us today.

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Chemical Company, Harrison, N. J.

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such discouraging aftermath? Was it a mistake to try to go direct to the consumer, with product, publicity and advertising, bypassing the commercial channels through which products in this field are normally marketed, and who perhaps should have been sold first before taking the whole story to the ultimate user? And, finally, was the size of the "backyard garden" market overestimated? Whatever the answers to these questions, the basic producers of soil conditioners are reported still convinced that a substantial market can be built up for these products, although some of them are perhaps beginning to feel that it may be several years off in the future,—and that more actual facts and test results may be necessary to back up the pretty stories of the advertising agency dreamers.

* * *

American Cyanamid have just filed application to register the name "Malathion" for insecticides. Could be that this variation will supersede "Malathon" which DuPont found a little too close to their mark "Alathon" registered for use on a synthetic resin.

* * *

Two papers on "Strobane", new insecticide being introduced by B. F. Goodrich Co. attracted attention at last month's meeting of the Chemical Specialty Manufacturers Association at Chicago. The possible role of this new insecticide in the agricultural field is being studied. Also under study, we imagine, are the legal angles of possible conflict with Hercules Powder Company's toxaphene, which is of course rather well protected with patents which in the normal course would extend rather widely into the surrounding field of terpene hydrocarbons.

* * *

The personnel sleuths are on the trail again. There is another of those big jobs being filled. It calls for a man of many skills and abilities, plus personality, dynamic leadership, etc. Besides having a background in the technical phases of the agricultural insecticide field, and sales, managerial and executive abilities of a caliber to endear him to the entire board of directors, it is also desirable that he be able to mix an acceptable martini, fill in adequately as a fourth for bridge, and be able to pinch hit against left handed curve ball pitching. Step right up, boys! And let's hope that they get the job filled soon, so the unsuccessful candidates can go back to putting in a full day's work for their present employers.

* * *

Count one more late starter in last month's symposium on the outlook for '53 sales of agricultural insecticides. Too late for inclusion in the May issue, but still too informative to be kept from our readers this month, is the following summary of the outlook as seen by a Georgia "bug-watcher". And, as our readers get this issue, we will be right in the middle of the period which he regards as most critical.

Writing on May 6, this insecticide executive observed that "There is every indication at this time that we have sufficient insects to

*Reg. U.S. Pat. Off.

In N-P-K fertilizers, if the superphosphate has not already been treated with an acid-stable surfactant such as NOPCO SP-200, caking can be prevented by adding ½-pound of NOPCO MF per ton of fertilizer.

NOPCO MF is an 80% active alkyl aryl sulfonate, and is supplied as a light tan flake which can be introduced into the fertilizer directly in the mixer. It improves the physical condition of the N-P-K mixture, reduces curing time substantially, and prevents caking of the bagged fertilizer.

Write us, and we shall gladly send you, without obligation, a generous sample of NOPCO MF for inspection and testing.

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insecticides. For quick, dependable delivery of your BHC and DDT requirements, contact TENNESSEE.

Also–for your Lindane, 2,4-D and 2,4,5-T formulations, rely on TENNESSEE, your basic source.

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give us a whopp[redacted] year. However, it has always bee[redacted]y feeling that it didn't make any d[redacted]rence how many bugs we had to [redacted]ry over, or how mild a winter we [redacted]d, the real, true criterion of the [redacted]e of season can be determined or[redacted] by the weather between May 15[redacted]nd July 10. If, during that peri[redacted] the weather is not extremely h[redacted] and if we get frequent light ra[redacted] once, twice or three times a we[redacted] and periods of cloudy overcast w[redacted]her, we will experience tremend[redacted] insect damage. On the other hand[redacted] we get extremely hot, dry weath[redacted] during that period, our only cha[redacted] for an infestation of any [redacted]ce is very late

PE

-OFF

come before late June or early July."

•

MCP For Barberry Control

Use of MCP (2-methyl 4-chlorophenoxyacetic acid) for control of barberry in 1953 shows promise of accomplishing much toward at least partial eradication of this unwanted plant which harbors stem rust disease of wheat, oats, barley and rye, according to the U. S. Department of Agriculture. MCP, a hormone-type herbicide, controls effectively the common or European barberry, the most widely prevalent stem rust host in the United States.

Tests conducted in Pennsylvania by Bureau of Entomology and Plant Quarantine, which is cooperating with eighteen of the important grain producing States in barberry eradication, demonstrated that the use of MCP is especially efficient in areas where barberry bushes grow in abundance. The chemical will be generally used in heavily infested areas this year, according to R. O. Bulger, leader in the department's cooperative barberry eradication project. Only a small quantity of the chemical, which is applied as a spray, is needed to kill a ba[redacted]rry, and, with less labor required for application, control operations will be speeded up and cost of treatment reduced. Previously it was necessary to cut off the barberry before applying a chemical to the cut surface, the department pointed out.

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PICCO Coal Tar Aromatic Solvents are available in a complete series of grades, from low to high boiling points, each grade being carefully fractionated to closely maintain specifications.
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Pesticides formulated with TENNESSEE's Benzene Hexachloride and DDT are real Killer-Dillers. Cottongrowers are putting the bum's rush on the boll weevil and the boll worm with these efficient insecticides. For quick, dependable delivery of your BHC and DDT requirements, contact TENNESSEE.

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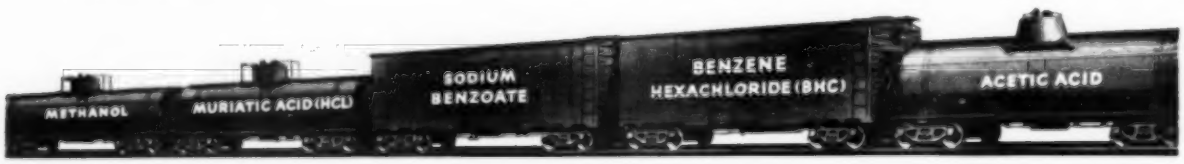

give us a whoppi[illegible] year. However, it has always bee[illegible]y feeling that it didn't make any d[illegible]erence how many bugs we had to [illegible]ry over, or how mild a winter we [illegible]d, the real, true criterion of the [illegible]e of season can be determined o[illegible] by the weather between May 15[illegible]nd July 10. If, during that peri[illegible] the weather is not extremely h[illegible] and if we get frequent light ra[illegible] once, twice or three times a we[illegible] and periods of cloudy overcast w[illegible]her, we will experience tremend[illegible] insect damage. On the other hand[illegible] we get extremely hot, dry weath[illegible] during that period, our only cha[illegible] for an infestation of any [illegible]equence is very late August and early September.

"Customers are buying very, very little material. Some material is being shipped by processors to distributors on consignment, or other similar arrangements. It is my feeling that they should be buying heavier than they are now, as insurance against a possible chance that the final fabricating facilities will not be sufficient to process, in a very short period, all of the materials needed, should a real infestation develop.

"Regarding the picture that is the most interest to most of us . . . that is, profits, it is my own feeling that it will remain as it is now until there is some honest-to-goodness buying by farmers. Since these farmers have been hurt for two years in a row by buying early, I do not anticipate that they will buy any material of any consequence until they 'needed it yesterday' or until they see the 'whites of the eyes of the bugs'. I do not feel that it is possible for this to come before late June or early July."

•

MCP For Barberry Control

Use of MCP (2-methyl 4-chlorophenoxyacetic acid) for control of barberry in 1953 shows promise of accomplishing much toward at least partial eradication of this unwanted plant which harbors stem rust disease of wheat, oats, barley and rye, according to the U. S. Department of Agriculture. MCP, a hormone-type herbicide, controls effectively the common or European barberry, the most widely prevalent stem rust host in the United States.

Tests conducted in Pennsylvania by Bureau of Entomology and Plant Quarantine, which is cooperating with eighteen of the important grain producing States in barberry eradication, demonstrated that the use of MCP is especially efficient in areas where barberry bushes grow in abundance. The chemical will be generally used in heavily infested areas this year, according to R. O. Bulger, leader in the department's cooperative barberry eradication project. Only a small quantity of the chemical, which is applied as a spray, is needed to kill a ba[illegible]rry, and, with less labor required for application, control operations will be speeded up and cost of treatment reduced. Previously it was necessary to cut off the barberry before applying a chemical to the cut surface, the department pointed out.

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Fertilizer Safety Meetings

IN at least three states during May, fertilizer safety was a well-publicized theme. Virginia, North Carolina and Maryland all held safety meetings, with a good attendance reported at all.

Wm. N. Watmough, Jr. vice-president, Davison Chemical Corp., Baltimore, addresses group. At left in photo is Donald Allen, Virginia-Carolina Chemical Corp., Portsmouth, Va., panel member.

May 8 was the date of both the Maryland and Virginia meetings. The North Carolina Sessions were held May 14. The former, at Baltimore, played host to some 65 persons, representing six states, the District of Columbia and Canada.

E. O. Burroughs, Jr., manager, Insurance Department, F. S. Royster Guano Company, Norfolk, Virginia, gave an illustrated address on "Housekeeping in Fertilizer Manufacturing Plants". Bernard T. Hartlove, electrician 1st class, The Mathieson Chemical Corporation, Baltimore, and president of Local 12138, United Mine Workers of America, spoke on "The Safety Program from a Worker's Viewpoint".

W. N. Watmough, Jr., vice president, The Davison Chemical Corporation, who gave the keynote address at the first National Fertilizer Plant Safety Session, responding to a request of the chairman, gave an extemporaneous talk. The remainder of the all-day session was devoted to answering, by the panel, questions which had been submitted in advance by the audience.

A. B. Pettit, supervisor, Industrial Health and Safety, Davison Chemical Corporation, Baltimore, served as chairman and moderator; John S. Roszel, manager, Industrial Relations, Mathieson Chemical Corporation, Curtis Bay Plant, was vice-chairman and assistant moderator, and John A. Miskelly, safety director, Mathieson Chemical Corp., Curtis Bay Plant, recorded the discussion.

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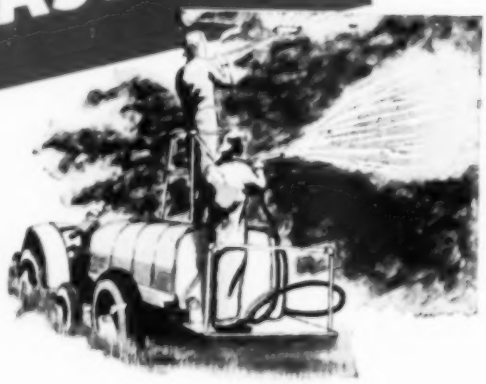

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Members of the Panel were: F. Wayne High, manager of operations, Baugh Chemical Company, Baltimore; Edward F. Carnell, superintendent, Davison Chemical Corporation, Savannah, Georgia; George F. Dietz, safety director, Fertilizer Manufacturing Co-operative, Baltimore, and Donald Allen, superintendent, Virginia-Carolina Chemical Corporation, Portmouth, Virginia.

Panel "On the Spot"

QUESTIONS put to the panel covered most of the hazards peculiar to fertilizer manufacture. They included how to secure dock boards and what kinds to use; precautions in storing ammonium nitrate and other nitrates; a listing of materials subject to spontaneous combustion and how to prevent fires.

One of the most frequently-discussed topics at safety meetings, is that of how to train new employees during the rush season. Mr. Carnell observed that the man himself should be his own best teacher by observing the situation. "The first law of nature is that of self-preservation", he noted, but added that in his plant "we make a practice of salting our few experienced key men and members of the safety committee among the new crews."

A similar question is how to get operators to wear the goggles, respirators, protective clothing and other personal protective equipment furnished them. "This is strictly a matter of supervision and perseverance on the part of the foreman", it was decided.

Elevator pits are another source of hazard and Mr. Carnell was asked what type of guard should be used on them. He replied that the grate type over the hold, with openings large enough to pass lumps with a minimum of breaking on the grate is best. It should be small enough to prevent a man's foot from slipping through, however. "Other precautions to be taken around elevator pits include minimizing traffic in the vicinity, locking switches when guards are removed for cleaning, and being sure the guards are replaced and seated snugly over the hole."

ROANOKE MEETING

FERTILIZER men from many parts of Virginia were present at the Roanoke meeting on May 9th. Chairman of the all-day session was William C. Richardson, Southern States Cooperative, Richmond, Va.

Leading off the program as first speaker, Dr. Edwin C. Kapusta, National Fertilizer Association, Washington, D.C., discussed "What's New in Fertilizer," acquainting those present with the current trend toward mixing various insecticides with fertilizer mixtures. That many hazards lie in the path of such a program was emphasized by Dr. Kapusta, who reminded that once such a combination is made, it comes under state and Federal laws and the mixer thereupon is faced with problems of registration and labeling. These matters do not apply to fertilizer products alone.

New methods of manufacture are still being investigated with nitric acid - sulfuric acid combinations reacting with phosphate rock in superphosphate manufacture. The trend toward higher analyses of fertilizer mixtures is moving ahead continually as state recommendations call for more concentrated applications of plant food.

Presenting the fertilizer safety problem from the viewpoint of one whose responsibility it is to inspect many plants each year, Curtis A. Cox, assistant manager of the manufacturing department, Virginia-Carolina Chemical Corp., Richmond, gave some case histories of accidents in his experience. He pointed out the importance of good housekeeping in any plant, both from the standpoint of its own benefit and also from the fact that an orderly plant is usually a safe one.

A prime cause of mishaps in many plants is the mishandling of tractors, Mr. Cox declared. "It is often difficult to know how well or how poorly a new man is likely to handle a tractor," Mr. Cox commented. "So it is always wise to allow only seasoned employees to operate these vehicles. A new man, hired

Bernard T. Hartlove, president of Mathieson local 12138, UMWA, addresses safety meeting at Baltimore. L to R in picture: John S. Roszel, Mathieson Chemical Corp., Baltimore; Mr. Hartlove; and A. B. Pettit, Davison Chemical Corp.

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during the rush season, will say, 'Sure, I know all about running a tractor,' whereas he may make such a pretense to get the job.

Mr. Cox upbraided the activities of what he termed "cave men" who persist in digging into a pile of fertilizer from the bottom and allowing dangerous overhangs to develop.

The foreman or superintendent must keep alert to the danger of complacency on the part of workmen toward the various hazards in a plant. Upon noting carelessness on the part of any workman, the man in charge should place him on a different job.

Other case histories related by Mr. Cox involved that of a dynamite man who was injured not by an explosion, but by a slide which came while he was placing the charge; the injury of another man when a plug blew out in the area of the gauge glasses at the mixer, spraying him with nitrogen solution; another seriously burned when a valve burst allowing acid to escape; other cases involved conveyor belts and pulleys.

"How to Develop a Safety Program in a Fertilizer Plant" was the topic handled by W. C. Creel, Safety Director, North Carolina State Department of Labor, Raleigh, N.C. He asserted that two main considerations, economic and humanitarian, are back of the safety movement. Although the humane angle is certainly one for strong consideration, still, the dollars and cents argument is the one that will sell the program. Managements unconvinced that a safety program will do more than consume time of well-paid employees, will listen to this appeal.

In a nutshell, it was stated that for a complete and effective program, some one person must be in charge. A definite plan of operation must be laid out, with the appointment of a safety committee, first aid training, etc.; and finally, all problems concerned with safety must be "pinpointed" . . . sought out and corrected.

In a talk entitled "Gangway for Gangboards," W. R. Connor, representing the Paul H. Werres Company, Washington, D.C., discussed some of the hazards to be encountered in loading and unloading freight cars or motor trucks. "All of the production of any plant must go through the gangboard bottleneck," Mr. Connor pointed out, and thus this part of the plant deserves considerable attention.

Accidents from shifting gangboards occur frequently in fertilizer and other plants, he reminded, and advocated the use of lightweight gangboards which fasten securely at each end to prevent slipping.

"The Value of Publicity in Safety" was discussed in a paper by L. A. Long, editor, *Agricultural Chemicals*, New York. That "publicity" as used in safety, is actually "education" was pointed out in the paper which outlined steps to be taken in making everyone in a fertilizer plant aware of safety and safe

(*Turn to Page 143*)

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To Penn Chemical Post

JACK L. WILSON

Pennsylvania Industrial Chemical Corporation has announced the appointment of Jack L. Wilson as director of sales. He will continue to serve as assistant to the president. Mr. Wilson has been associated with the company for five years as assistant to the vice-president and assistant to the president.

He is a graduate of Mercersburg Academy and Carnegie Institute of Technology, and also did post graduate work at the University of Pittsburgh. Before joining Pennsylvania Industrial Chemical Corporation, he did engineering design work on heat transfer equipment.

•

Pacific ESA to Tahoe

Connolly's Hotel on Lake Tahoe, California, is the scene of the June 23-25 meeting of the Pacific Branch, Entomological Society of America. Program plans have been completed including invitational papers, symposia and panel discussions covering the development and evolution of a new insecticide; cooperation between research workers, the extension service and industry; recent developments in the control of forest pests in the west and highlights in the development of entomology in the area.

Discussions will also cover the control of ectoparasites of livestock and absorption and translocation of pesticides in plants.

Extension entomology will be the subject of discussion at an evening session and a program has been planned for the entertainment of ladies at the meeting. A boat trip around the lake and a bus trip to Virginia City, Nevada, are on the agenda for visiting ladies.

Joins Williams Crusher

SCHUYLER A. PALMER

The appointment of Mr. Schuyler A. Palmer, Pasadena, California, as sales agent for Arizona and Southern California has been announced by Williams Patent Crusher & Pulverizer Company of St. Louis.

Starting his own business in January 1953 as the S. A. Palmer Company, Mr. Palmer has previously served as sales engineer, then as sales manager and vice-president of A. E. Poulsen & Company. A graduate of the University of Southern California, Mr. Palmer is also a veteran of several years in the army.

He will be available anywhere in his territory to discuss and advise on the use of Williams equipment for any grinding, pulverizing and separating operation, and to handle the repair of any existing Williams equipment, the company states.

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CSMA Told of Strobane

A new basic insecticide material, described as a chlorination product of a mixture of terpene hydrocarbons, now available for test purposes, was discussed in a paper by D. L. Kent, head of biochemicals development, B. F. Goodrich Chemical Co., Cleveland, at the 39th mid-year meeting of the Chemical Specialties Manufacturers Assn., held at the Drake Hotel, Chicago, May 18-19. Screening tests conducted by Goodrich with the new chemical, which is designated "Strobane", indicate that it is highly effective against a broad range of agricultural pests, Mr. Kent stated.

In another address before the Insecticide Division of the C.S.M.A., Robert J. Dicke of the Department of Entomology, University of Wisconsin, said that ineffective fly control in many dairy areas for the past two years could not be laid to resistance alone. An overwhelming fly breeding potential appeared to be a more logical control fault than insecticide failure, Mr. Dicke said. He pointed out that satisfactory fly control was obtained on most farms where a program of reasonable sanitation management and insecticide control was employed. Effective control was not obtained on farms where excessive fly breeding occurred, and control depended upon insecticides only.

The Insecticide Survey conducted by the trade association showed that more than 13 million gallons of liquid insecticides, with a retail value of about $30,000,000 were packed in 1952. Powdered insecticides, including wettable types showed losses ranging from one and one-half to 14 percent last year. Livestock wettable powders, of which 1952 production was estimated at 725,000 pounds, were mainly responsible for the decline in the powder type insecticide group.

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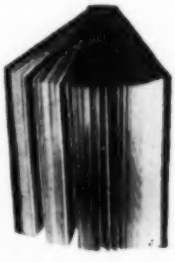

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Shell Chemical Corp., New York, on May 26, announced reductions on aldrin and dieldrin, as follows: (these prices in carload drum lots)

Aldrin, 60%, reduced from 64.5¢ per pound to 53.8¢

Dieldrin (technical flake) reduced from $2 lb. to $1.80 lb.

Dieldrin 20% solution, reduced from $3.75 gal. to $3.42 gal.

SAFETY MEETINGS

(Continued from Page 139)

working practices.

The parts played by contests, posters, awards, press notices and word-of-mouth "advertising" were discussed, and the advantages of good public relations were pointed out. "Many communities need to be shown the better side of the fertilizer industry," the paper declared, "and good publicity about safety progress can bring about a more friendly feeling toward the dusty plant down by the railroad tracks," it went on.

N. Carolina Meeting

THE group at Winston-Salem named Hugh S. Surles, Rocky Mount, N. C. chairman for 1954 at the May 13-15 meeting. Some 45 persons were on hand.

W. G. Jones, safety director of the R. J. Reynolds Tobacco Co. told how their accident-frequency rate has diminished since 1946, from 10.2 to 1.8. This was achieved through co-operative effort throughout the company with 11,000 employees. How the organization was made to work was explained by Mr. Jones. Safety inspection teams, a rotation system and good housekeeping were of prime importance.

C. T. Wright, American Mutual Liability Co., Raleigh, spoke on "How to Organize Safety"; and E. B. Manning, Liberty Mutual Life, Charlotte, described the meaning of a "Lost Time Accident".

The storage and use of explosives were discussed by E. J. Meyers, E. I. duPont de Nemours & Co., Inc., Wilmington, Del.; and a movie, "The ABC of Hand Tools" was shown, courtesy of General Motors Corporation.

C. W. Wyrick, chief of the Greensboro fire department, chose the subject, "Fire! Fire! Fire!," pointing out hazards in fertilizer manufacture.

Mr. Jones appeared on the program in place of W. C. Creel, Raleigh, who was unable to be at the meeting because of illness.

SOIL CONDITIONERS

(Continued from Page 97)

if raw material sources and manufacturing methods are not controlled rigidly.

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Here is a complete analysis of the relationship between crops and phytophagous insects together with a full analysis of the insect resistant varieties of important crops, such as wheat, corn, cotton, sorghums, potato.

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This text presents the basic scientific facts and principles behind the production and utilization of agricultural chemicals. The why, when, where and how of fertilizers is expressly discussed, with particular emphasis on the importance of lime and fertilizer materials in maintaining and increasing the productivity of soils.

Weed Control

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"In some experiments at Ohio State University, for instance, treatment resulted in a 40 percent yield increase in oats, and no yield increase in sugar beets on an adjoining plot. Yet it is accurate to emphasize that yield increases have been reported in the cases of a sufficient variety of crops to warrant further concentrated study of the yield increase-soil conditioner relationship.

"Of potential major significance in the agricultural and horticultural fields is the apparently improved utilization of fertilizer added to soils treated with chemical conditioners. In tests, it has been shown that the lowest corn yield per acre occurred in the case of soil which had received neither conditioner nor fertilizer. The highest yield, on the other hand, was obtained when both fertilizer and "Krilium" were applied, showing that addition of the conditioner resulted in increased utilization of fertilizer.

"A recent publication from the U. S. Tobacco Experiment Laboratory, Lancaster, Pa., reported a 71-

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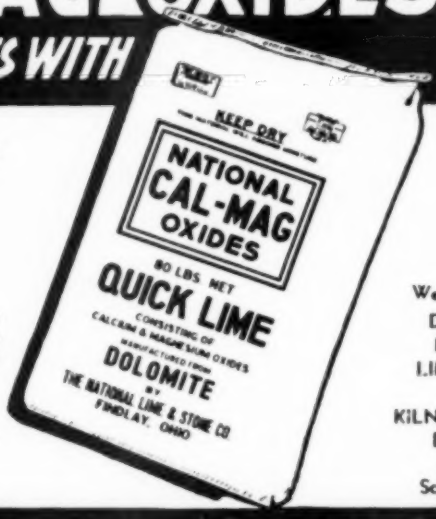

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pound-per-acre gain in yield of field tobacco grown in soil conditioned with "Krilium". With "Krilium" plus 120 pounds of potash per acre, the average yield increase was 223 pounds per acre."

NFA PROGRAM

(Continued from Page 53)

School of Agriculture, North Carolina State College, Raleigh, representing the Land Grant Colleges.

Dr. O. J. Kelley, Head, Division of Soil Management-Irrigation and Dry Land Regions, U. S. Department of Agriculture, Beltsville, Md.

W. F. Price, Plant Food Division, Swift & Company, Chicago, Illinois, representing the fertilizer industry.

Address: "The New South," Hugh M. Comer, president, Avondale Mills, Sylacauga, Alabama.

Unfinished Business

New Business

Memorial Record:
W. Morris Newman

Adjournment

The annual meeting of the new board of directors will be held immediately after adjournment of the convention for the purposes of organizing and transacting any business that may properly come before the board.

WASHINGTON

(Continued from Page 97)

Another reduction having perhaps the loudest repercussions, is Congressional action on ACP payments. It now appears definite there will be a sizeable ACP program in 1954. Secretary Benson's proposed deep cut is disregarded by Congressmen who are sensitive to falling farm income. The program looks now as though it will total around 200 million dollars, down 50 million from current authorizations but above the Secretary's recommendation.

Significantly, USDA's reorganization seems to be considered a related matter in Congressional thinking. Support increased when the ACP allotment was upped. Immediate appointment of two new Assistant Secretaries, will be the first evidence of the new shape of the Department. They are John H. Davis to head farm programs and Romeo Short in charge of foreign trade. Disposition of entomology and fertilizer programs will await these and other top level moves.

* * *

Two officials of the BEPQ, Dr. Fred. C. Bishopp and Ernest R. Sasscer; two from BPISAE at Beltsville, Dr. Sterling B. Hendricks and Dr. Henry A. Jones, received the Department of Agriculture's recent Distinguished Service Awards. The honor was granted to seven men in all in ceremonies headed by Secretary Benson. All have gained recognition by their accomplishments over the years.

Fred. C. Bishopp, assistant chief of BEPQ, has been instrumental in broadening the areas of cooperation between industry and government. During recent years he has directed work on DDT since it was first sent to this country for study during the War. He is a noted authority on medical and veterinary entomology. Among his other awards are certificates from the U. S. Army and Navy and from Great Britain. His Majesty's Medal for Service in the Cause of Freedom.

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SUPPLIERS BULLETINS

(*Continued from Page 99*)

developed to handle the new control chemicals of the last decade. All-told, there are some 50 different types of sprayers and dusters on the market today, the manual index shows. There are household sprayers of different types, compressed air and knapsack sprayers, hand spray pumps, wheelbarrow and traction sprayers, and power sprayers with subclassifications of hydraulic, hydro-pneumatic, blower, and aerosol. The duster family includes hand, wheelbarrow and traction, and power dusters.

In the face of such variety, how is the user to know which is for him? The handbook guides him by defining the characteristics and explaining the use of each. For example, the multi-purpose sprayer. "This type," says the book, "has the necessary pressure range to be used for weed spraying at 30 to 50 pounds or for spraying fruit trees or livestock at pressures in the range of 250 to 500 pounds or more, or any pressure in between. Because of the type of pump and agitation provided, the user has a free choice of spray materials." It goes on to give a detailed description of this type equipment.

A section on operation of equipment gives a practical counsel on the handling of power sprayers, with formulas for determining equipment and adjustment to apply a required amount of material to a specific area. This includes a study of nozzles and their characteristics. The new low-volume, low-pressure sprayers are evaluated.

A final chapter headed "Useful Information" offers instructions for calibrating a power sprayer. There are also tables and diagrams that make it a truly working handbook.

The manual is being sent as a public service to county agents, 4-H Club leaders, teachers of vocational agriculture and extension specialists. The regular price is $1, but reduced rates are available when purchased by groups, clubs, or classes, the NSDA says. Copies are available from the National Sprayer and Duster Association, 4300 Board of Trade Building, Chicago 4, Ill.

•

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The Sturtevant Mill Co., Boston, Mass., a major manufacturer of grinding and pulverizing equipment since 1873, has acquired all interests for the Micronizer manufactured by the Micronizer Company, Moorestown, New Jersey. This includes all rights of manufacture and sales including the registered trademarks and goodwill of the company.

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Large Attendance at first annual

California Fertilizer Conference

THE first annual California Fertilizer Conference, held in Marysville, California on May 7 and 8, saw more than 200 persons in attendance. They came from all sections of California, and from other areas including Oregon, Washington, British Columbia, Idaho, Nevada, Arizona and Washington, D. C. Those present represented the fertilizer industry, the University of California, the Soil Conservation Service, farm equipment dealers, etc.

The conference was sponsored by the California Fertilizer Association and the University of California Agricultural Extension Service. Plans are now developing for next year's event in another area of the state, according to S. B. Tatem, Swift & Co., Los Angeles, CFA president.

The Extension Service of Yuba, Sutter and Butte Counties developed the program for May 7, which was presented under the direction of Dr. William E. Martin, extension soils specialist of Berkeley. Information was presented which points up many of the problems encountered in the search for complete knowledge regarding soil management, particularly fertilization. It was reported that there are 14 different soil series with 27 variations in Sutter and Yuba Counties alone, where annual rainfall varies from 20 to 70 inches. Ninety different crops are grown commercially in the two-county area, which fall within four general crop classifications, it was reported. Most row crop and fruit growers find it profitable to fertilize following a regular schedule, but alfalfa and improved pastures are sometimes neglected, it was pointed out. Crop rotation programs are beneficial, but it was noted that bean yield has been dropping off in recent years, and research is going forward to determine the proper fertilizer combination to reverse the trend.

Also pointed out was the fact that soil fertility problems constantly change; for example, potash was not a required element for almonds 25 years ago, but recently, some areas have become deficient in potash. Response to potash is apparent in almond trees during year of application on shallow soils, but does not show until the second years in the deep Chico area soils. In both cases the residual effect lasts 4 to 5 years.

Papers were presented by farm advisers of the three counties on crop systems and soils, fertilizer results with fruit trees, with rice, with grain, with alfalfa, and with range and pasture fertilization. The afternoon of May 7 was devoted to a field tour of fertilized test plots. Five improved pastures were examined.

Discusses Soil Minerals

THE May 8 program was under the sponsorship of the Soil Improvement Committee of the California Fertilizer Association, with J. H. Nelson of Stockton presiding. Mr. Nelson is chairman of the subcommittee on joint meetings of the Association and the University. This program was devoted to reports on fertilizer research of statewide nature. Technicians of the University, the Soil Conservation Service and the fertilizer industry participated. M. E. McCollam, American Potash Institute, San Jose, chairman of the Soil Improvement Committee, outlined the objective of his committee.

Dr. L. D. Davis, Professor of Pomology, University of California at Davis, presented an outline of the role of mineral fertilizers in plant growth. Dr. D. G. Aldrich, Jr., Department of Soils and Plant Nutrition, Citrus Experiment Station, Riverside, reported on fertility research at that institution.

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Dr. W. E. Martin, Extension Soils Specialist, Agricultural Extension Service, Berkeley, presented two papers, one on the general soil fertility activities of the Extension Service and the other on fertility tests in pots as diagnostic tools. Leonard R. Wohetz, Soil Conservation Service, Oakland, spoke on "Fertilizers — A Tool in Conservation Farming."

Allan B. Lemmon, Chief, State Bureau of Chemistry, Sacramento, outlined California laws which have to do with the activities of fertilizer salesmen. Dr. Albert Ulrich, Dept. of Plant Nutrition, University of California, Berkeley, spoke after dinner on 3 years' work on sugar beet plants in temperature controlled greenhouses. Rod Taft, American Potash and Chemical Corporation, Los Angeles, reviewed the unusual story of potash production in California and the United States, and exhibited a colored motion picture on the subject. F. Haven Leavitt, Shell Chemical Corporation, San Francisco, sketched the history and manufacture of anhydrous ammonia and ammonium sulphate, with an accompanying motion picture. Forrest Fullmer, American Potash Institute, Newport Beach, reported on nutrient levels found to exist in San Diego County lemon groves through leaf tissue analysis. George P. Bloxham, Pacific Guano Co., Los Angeles, pointed out responsibilities of fertilizer salesmen to the industry and its customers and of management toward salesmen.★★

•

Fertilizer Safety Program

Use of carbon dioxide in reducing hardened piles of fertilizer in storage will be demonstrated as part of the Fertilizer Safety Section meeting in Chicago, October 22, it has been announced. The demonstration will be put on by the Cardox Corporation at the International Minerals & Chemical Corp. plant at Chicago Heights, a Chicago suburb.

The more formal part of the two-day safety meeting, will begin Wednesday, October 21. According to present plans, general chairman John E. Smith, Spencer Chemical Co., Kansas City, Mo. will make his annual report; J. S. Fields, chairman of the nominating committee will report and Dr. Stewart L. Rankin will speak on the subject: "Safety — A Way of Life". Discussion periods

DR. STEWART L. RANKIN

will be provided to cover case histories, investigations and preventive measures to reduce the number and severity of accidents. Curtis A. Cox, Virginia-Carolina Chemical Corp., Richmond, Va., will describe CO_2 blasting preceding Thursday morning's demonstration. Following the trip to IMC's plant at Chicago Heights on Thursday, the meeting will continue at the Hotel Hamilton.

•

Tomasek Heads Pitts Ag.

Herbert F. Tomasek has just been named acting manager of the Pittsburgh Agricultural Chemical Co., New York, a division of Pittsburgh Coke & Chemical Co. William J. Haude, formerly president of Pittsburgh Agricultural Chemical Co., has resigned to take up residence in the mid-west where it is understood he will form a company to formulate and warehouse agricultural chemicals. Mr. Tomasek was just recently made sales manager of the company. He joined the division in 1948, and until recently was field sales manager with headquarters in St. Louis.

•

Correction Noted

In an article by Dr. Charles E. Palm in our April issue, reference was made to "Crop Protection, Ltd." of England. This should have been "Plant Protection, Ltd.", it has been pointed out.

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A new mite killer for use on ornamental plants and agricultural crops has ben announced by the insecticide division of Geigy Company, Inc. This chemical, known as "338" during the final two years of field testing, is called "Chlorobenzilate."

Effectiveness of "Chlorobenzilate" was established under a variety of conditions in the United States, Canada and Europe against a great number of species of mites and red spiders on a wide range of crops and ornamentals. These plants included apples, peaches, avocados, grapes, almonds, walnuts, berries, beans, celery and cantaloupes as well as roses, azaleas and nursery stock, Geigy says.

"Chlorobenzilate" is available as a 25% emulsion concentrate, a 25% wettable powder, 3% dust and in the technical form. This material is said to be compatible with most insecticides and fungicides and possesses a relatively low level of toxicity to animals.

Among some of the more important test data recorded were those on mites in all of the large apple growing regions in the United States where, in general, one pint of "Chlorobenzilate" emulsion or one pound of wettable powder provided control. These results were obtained on mites known to be resistant to some of the organic phosphorus insecticides in addition to other species of mites.

The silver peach mite, important pest of peaches in the Northwest, was controlled with sprays containing one pint of "Chlorobenzilate" emulsion per 100 gallons of water. Other results included control of the citrus bud mite in California, two-spotted mites on alfalfa, mites on cotton and red spiders on greenhouse plants, it is reported.

•

L. G. Campbell Suffers Attack

L. Graham Campbell, Chamberlain & Barclay, Cranbury, N. J., was reported at press time to be "improved" after a recent heart attack. Mr. Campbell spent some time in a hospital immediately after the attack, but is now resting at his home in Cranbury. A member of the board of directors of the National Fertilizer Association and a well-known figure at NFA and other fertilizer meetings, Mr. Campbell is particularly prominent in agricultural affairs in the potato-growing area of New Jersey served by his company.

•

Clemson Conference June 22

June 22 and 23 are the dates set for the eleventh annual convention of the Association of Southern Feed and Fertilizer Control Officials, to be held at the Clemson House, Clemson, S. C.

J. J. Taylor, Tallahassee, Florida, head of the Association, will present his presidential address during the opening session and Dr. R. F. Poole, president, Clemson Agricultural College, will welcome the group to the campus.

"Public Relations" will be discussed by Dr. Webster Pendergrass, University of Tennessee, Knoxville; and Dr. M. D. Farrar, South Carolina Agricultural Experiment Station, Clemson, will talk on "New Uses of Insecticides in Fertilizer and Soil Toxicity Studies". A discussion on minor elements will be conducted by N. R. Page, Clemson.

Other features on the program will include the new NFA sound film, "Cash In On Corn" and a panel discussion on "Wheat Population Can Be Fed Adequately by American Farms?" Other subjects to be covered in talks include chemical control in industry, and dairy cattle nutrition.

•

Grace to Hold Davison Stock

W. R. Grace & Co. has no current plans for "either offering to sell present holdings of Davison Chemical Co. . . . or to buy additional shares," Grace stockholders were informed at the company's annual meeting in May. Grace holds 22.5% of Davison's common stock and 18.9% of the preferred.

Grace Chemical Company, a subsidiary, has recently announced plans to build a $19 million nitrogen plant at Memphis, Tennessee. The new installation will have capacity for production of 250 tons of ammonia per day when completed in 1954.

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C. B. Dunne Dies in New York

Charles B. Dunne, vice-president of French Potash & Import Company, New York City, died May 10 on Staten Island, New York.

LISTENING POST

(Continued from Page 91)

fruits free from blemishes were collected at harvest from each treatment. The samples were each divided into two lots of 25 fruits. One lot was held at room temperature and the other placed in cold storage. After one month, the second lot from each treatment was removed from cold storage and placed at room temperature. The data on fruit rotting from the four fungicide plots in the two series are presented in Table 2.

Also included are data on fruits selected as free from blemishes from a nearby grower-sprayed orchard. Rotting was extensive in the fruits from the grower-sprayed orchard and in all plots except those receiving captan. Since the final spray application was made 37 days before harvest, it is possible that *B. ribis* infections may take place during the summer and remain latent until the fruits approach or attain maturity. The financial loss to the grower occasioned by this disease can be tremendous.

These orchard trials demonstrated the effectiveness of "captan" ("Orthocide 406") n-trichloromethylthio tetrahydrophthalimide for preventing orchard and post-harvest losses from summer apple diseases. A supplementary report in southern Indiana by Eric G. Sharvelle is concerned with the effect of captan on the finish of russet-sensitive varieties.

In 1952, different summer spray programs were applied to commercial plantings of russet-sensitive varieties in three locations in Indiana. At harvest time fruit from the different spray plots was graded into arbitrary russet categories based on the percentage of the fruit surface involved by the russet condition. No attempt was made to distinguish between the various types of fruit russet, and the enlarged lenticel condition found on Golden Delicious was included as a type of russet condition. The results of this study are summarized in Table 3.

In the Purdue orchards at Lafayette, Indiana, a block of the variety Golden Delicious received a uniform fungicide treatment of liquid-lime sulfur (1½ gals.-100 gals.) in the pre-bloom sprays followed by a wettable sulfur program during bloom. Starting at petal-fall part of the block was sprayed with "Magnetic 70" sulfur paste and the remainder with captan 50 W at 2 pounds in 100 gallons. The fungicides were combined with lead-arsenate, parathion and DDT, and were continued up to and including the sixth cover spray. At harvest time 2 percent of the fruit receiving "Magnetic 70" sulfur was entirely free of russet as compared with 14 percent for the captan-sprayed fruit.

Late blight was found by pathologists of the Connecticut Agri. Experi. Station, New Haven, on May 26. The blight appeared on sprouts from a potato cull pile on a farm in Tolland county. This is one of the earliest records of appearance of this disease in Connecticut. Favorable weather this spring is thought to be the cause. Late blight spreads rapidly on warm, rainy days and cool nights.

The U. S. Federal apple grading law permits a russet tolerance of 10 percent of the surface area for U. S. Fancy grade in varieties such as Golden Delicious and Grimes Golden. On this basis 79 percent of the captan-sprayed fruit in the Purdue Orchard graded U. S. Fancy as compared with only 41 percent for the sulfur-sprayed fruit.

In the Purdue Orchard at Bedford, Indiana, a block of Grimes Golden received a uniform fungicide application of liquid lime-sulfur in the pre-bloom period followed by wettable sulfur during full bloom. At petal-fall, part of the orchard was sprayed with ¾-1½-100 bordeaux up to the third cover spray, and then ferbam (¾-100) in the fourth, fifth, and sixth cover sprays. The remainder of the orchard received captan 50W (2-100) from petal-fall through the sixth cover. In both cases the fungicide was combined with para-

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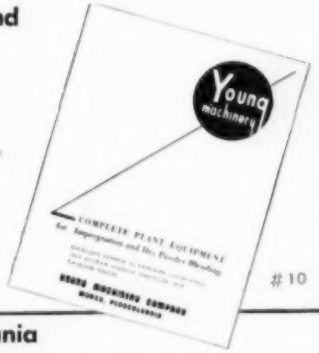

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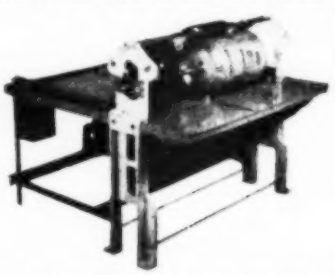

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thion and DDT. From the results summarized in Table 3, it is apparent that the use of captan greatly improved the finish of Grimes Golden apples.

With this variety, 91 percent of the captan-sprayed fruit was graded U. S. Fancy as compared with 44 percent for the fruit receiving the bordeaux fungicide program.

In the third location, at Clayton, a spray program of home-wet sulfur from petal-fall through the cover sprays was compared on Golden Delicious with a captan program at the rate of 1 lb. captan 50W per 100 gallons, instead of the recommended rate of 2 pounds to 100 gallons. Even at this reduced rate of application 98 percent of the captan-sprayed fruit was graded U. S. Fancy as compared with 28 percent for the home-wet sulfur schedule. When the captan applications were delayed until first cover spray, the beneficial effects were apparently reduced (Table 3).

The apparent increase in summer diseases in recent years has necessitated widespread usage of bordeaux mixture as a summer spray with consequent russetting on tender apple varieties. The ability of captan to control summer apple diseases, together with its beneficial effects on the finish of sensitive varieties, suggests a possible solution to the problem of summer disease control on these varieties.

FUNGICIDE

(*Continued from Page 56*)

but at the same time desirable. Robertson Fungicide possesses adhesive value, as is demonstrated by the simple comparison in Figure 3.

Associated with the copper in Robertson Fungicide, and possibly contributing to its usefulness, are trace amounts of other metals including manganese, aluminum, phosphorus, magnesium, nickel, cobalt, molybdenum and tin.

This fungicide was first field tested during 1944; and since 1947 has been incorporated in the test programs of many agricultural experiment stations. The reports of these tests have been collected in a compilation that includes each year's results of all the cooperating stations. (Copies are available from the H. H. Robertson Company, Pittsburgh.) Typical data (for a dry year) from the reports of the 1952 field tests are shown in Figure 4 for potatoes and tomatoes.

Typical data for a wet year are shown in Figure 5.

Comparatively good yields for the dry year of 1952, when disease incidence was naturally low, indicated very little toxicity. Further evidence of low toxicity was obtained in a test carried out under controlled conditions in a greenhouse, as follows:

Bean plants were sprayed with the fungicide at the time the first trifoliate leaves appeared and again one week later. Two weeks after the final spraying, the plants were cut off at the ground line and weighed.

The fungicides were applied at three dilutions: at the rate normally recommended for field application, at four times the recommended rate and at eight times the recommended rate.

Each planting, comprising approximately 200 pots, was randomized according to size and arranged into groups for spraying. Each pot was exposed under the spray for a measured interval while it was turning slowly, and the groups were randomized in their location on the benches to minimize variations in growth response. Watering was done at pot level to avoid washing the spray residue off the leaves. Suitable controls were included in each experiment.

Statistical analyses of the data disclosed a high degree of reproducibility between tests and between treatments within tests. The bar graphs shown in Figure 6, demonstrate the rank of the several materials in each planting.

Conclusions. Insofar as its effect upon young bean plants is concerned, the conclusion appears valid that Roberston Fungicide is no more toxic than other widely used copper compounds or the particular organic compounds with which it was compared. The data obtained under con-

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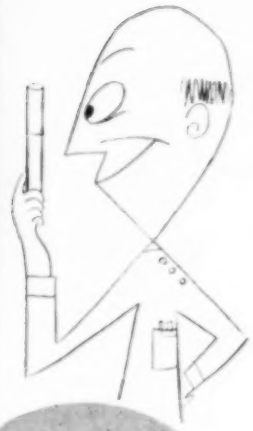

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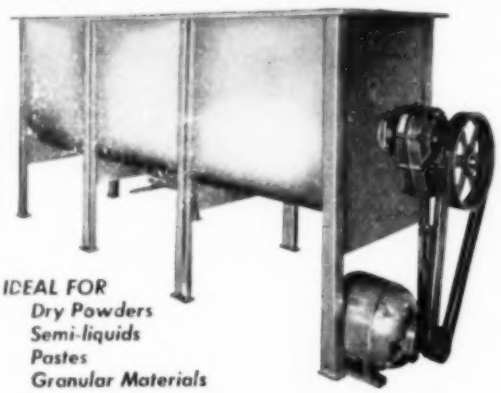

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ditions independent of weather, constitute a significant check on the yield figures from field tests, particularly those of dry years when the effect of blights was at a minimum.★★

TECHNICAL BRIEFS

(*Continued from Page 105*)

the volume includes practically all of the species in North America, north of Mexico.

The volume is priced at $10.25 postpaid in the United States, and for other countries $10.50 postpaid. It can be obtained from J. J. Davis, Purdue University, Lafayette, Indiana, and checks made payable to the Thomas Say Foundation.

GRAIN PROTECTION

(*Continued from Page 41*)

ern corn and other small grains!

At this meeting, highlighted by an old-fashioned southern barbecue, those in attendance were shown some shelled corn which had been treated with "Pyrenone Grain Protectant" nearly two years previously.

Eight hundred bushels had been put under test, and for the benefit of the guests, probe samples were taken all over the bin. *Not a single weevil could be found.*

These agricultural leaders, accustomed to inspecting corn storage where 25 per cent of the corn had been lost in a single storage season due to insects, could hardly believe their eyes. They gave it careful scrutiny and, characteristically, they bit into a kernel or two, a seemingly infallible test for sound corn in the south.

A year later, the First Southern Corn Conference on Insects and Diseases was held in Thomasville. About 25 agricultural experts were invited to this conference by the Georgia Experiment Stations to discuss, in a two-day session, all of the problems in corn production in the south. The topics discussed included types of storage, hybrid seed, field infestation, fertilizers, as well as control measures for storage.

Our own role in this meeting was a minor one; we simply made it possible, for the first time, for farm leaders to get together for the discussion of common problems. This was followed up by publishing a record of the proceedings and recommendations of the group for improved corn production and giving it wide distribution throughout the south.

With these meetings, and smaller meetings for dealers and farmers in other parts of the south, the first objective had been accomplished—the proper introduction of the materials. The next step, of course, was to reach the farmers themselves.

During the 1953 wheat harvest, USI will participate in a series of meetings in Texas, Oklahoma, Colorado and Nebraska. In Kansas, with the cooperation of the Kansas Wheat Improvement Association and Kansas State College, a series of five farmer meetings were arranged in five strategically-located cities in the major wheat areas during April.

The value of these meetings naturally must be measured by the distribution setup. This year, in addition to its own dealer system, USI will have the added advantage of the far-flung distribution network of Niagara Chemical, Division of Food Machinery and Chemical Corporation, to get its protectants on dealer shelves. (See box.)

The Niagara Company is an old hand in the agricultural chemical field, and next year will celebrate its fiftieth birthday. With its headquarters and main plant at Middleport, New York, the company has a total of 14 plants in the United States, Canada and Mexico, as well as warehousing facilities in practically every state.

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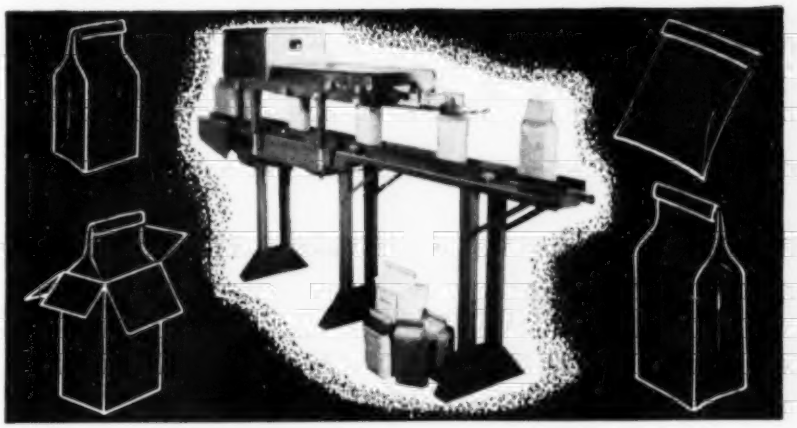

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SPRAY EQUIPMENT

Continued from Page 35)

the judgment of when to repump. If a 1.5 gallon nozzle is used, one gallon of spray will last over 40 minutes and will spray about two thirds acre for early season. By using two hand wands, the acreage treated per hour can be doubled.

Other uses for the cotton sprayer are rapidly being developed.

By adding a special bracket and hoses, one can spray weed control materials on the row behind the planter or press wheel. For this band spraying, one nozzle manufacturer now makes an even spray fan tip. Ordinary fan tips make a heavier deposit at the center, so that when the patterns overlap on a weed boom, an even spray results. This new tip for hand spraying makes an even deposit all the way across the fan.

By adding special shoes, nozzles, and hoses, the sprayer can be used to spray selective weed killing oils on the weeds (especially grass) in young cotton, in wet seasons when weeds tend to get out of hand. Field trials for the past two years have resulted in efficient designs for these types of applications.

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DEFOLIATION and leaf killing are now common usages made of the cotton sprayer. For short cotton (24 to 30 inches high) the 3-nozzle cotton drops and nozzle outlets are sufficient. For cotton 3 to 4 feet tall, special long drops with double swivel nozzles on the end are needed to reach inside. For taller cotton, it is not practical to drag long drops from the ordinary boom through the cotton. For this tall cotton (4½ feet or taller) a special type of high clearance sprayer is required.

It has been found that the high clearance sprayers designed for corn are entirely unsatisfactory for cotton. These corn sprayers are made for an upright crop with no leaves or crop near the base. In cotton, they drag or run over the lower branches and fallen plants, knocking off bolls and damaging the plant. A high clearance cotton sprayer must have smooth lifting type shields that go from near the ground to the full clearance height of the machine. The driver must be able to raise the shield a foot or so for turning over the ditches at the end of the row. There must be adequate power and an especially low gear for turning on these row end ditches.

Along with ground low gallonage spraying, airplane spraying has come into prominence. Special nozzles have been developed to fill the requirements of the different usages. Good check valves are now available that give a sharp cut-off of the spray, greatly reducing the danger of spray drift to susceptible crops.

Low gallonage crop and weed spraying is a relatively new industry. The fast acceptance of these principles for insect and weed control has progressed so rapidly that it has not been possible for the mechanical improvements to catch up to public demand. But, through the combined efforts of industry and other interested persons and groups, it will soon be possible for every farmer to take advantage of these improvements.★★

AMMONIA STORY

(*Continued from Page 38*)

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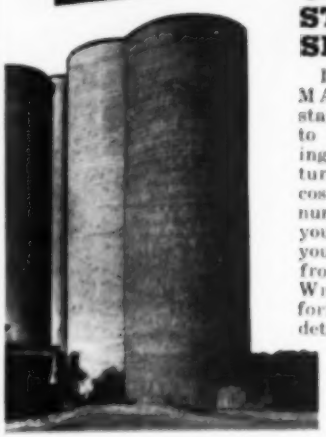

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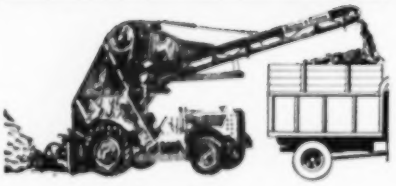

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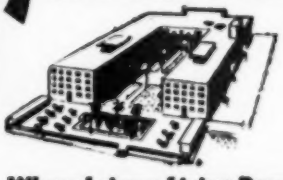

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American Cyanamid Company's new insecticide, "Malathon", successful in the control of a number of agricultural pests, has also shown ability to control DDT-resistant flies in areas where flies abound.

According to directions recently accepted by the U. S. Department of Agriculture, flies may be controlled by spraying a mixture of 2 gallons of "Malathon" and 100 gallons of water. Suggestion is also made that the insecticide may be mixed with molasses, corn syrup or sugar to attract flies.

The makers report that experimental work now under way is expected to broaden the use of the product. However, until sufficient evidence is available to secure acceptance for other uses, American Cyanamid Company advises against the use of "Malathon" where milk is processed and stored, directly on animals or in dairy barns, or where feed and food products may become contaminated.

•

Foresees Chemical Expansion

That the American chemical industry will increase five-fold between 1950 and 1975, was predicted by William H. Ward, vice-president of E. I. duPont de Nemours & Co., Inc., Wilmington, Del. at a two-day meeting of the Industrial Council at the Rensselaer Polytechnic Institute recently. The industry already is sixth in size in the U. S., he said.

Leland I. Doan, president of Dow Chemical Co., Midland, Mich., told the group that new products are the essence of the industry's development. One large company, he said, estimates that 60% of its present sales are in products not in existence 20 years ago. Another says that half of its products are new since 1940; and still another that 40% of its sales are from products not made ten years ago.

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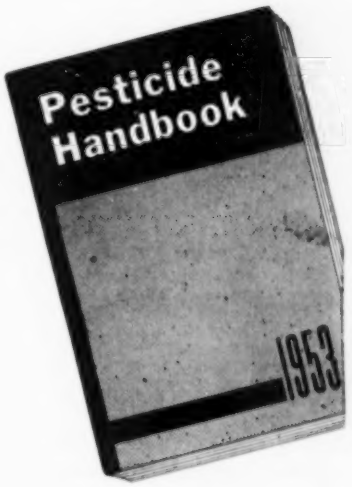

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about the editor —

Dr. Donald E. H. Frear, Editor of PESTICIDE HANDBOOK 1953, is one of the leading authorities on the chemistry of pesticides. He is the author of "Chemistry of Insecticides and Fungicides," the first book dealing with this subject published in the United States. In addition, he has written several other books, including "Chemistry of Insecticides, Fungicides, and Herbicides." Dr. Frear is Professor of Agricultural and Biological Chemistry at The Pennsylvania State College.

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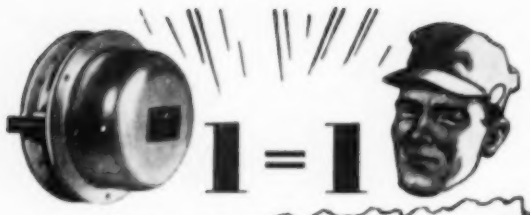

"We have used your Bin-Dicators in our fertilizer plant for some time and would not be without them. I can show you a case where a single Bin-Dicator replaces a man," writes a New England manufacturer.

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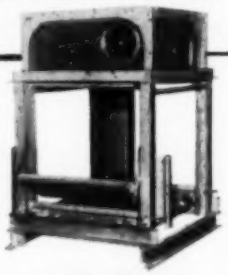

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Fully automatic in operation, the Model 200S separates offweight packages from those properly filled by having the motor-driven two-way conveyor separate then deposit them at *opposite* ends of scale.

The Model 200S — or one of the other outstanding Thayer Scales — holds the answer to your weighing, filling or checkweighing problems. For more details, write today outlining your problem.

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Tale Ends

A COMMITTEE of educators, botanists and state officials in New Jersey are seeking to raise $75,000 to buy a 65-acre tract of virgin timber, said to be one of the very few remaining in the U. S., to save it from being cut for lumber. Botanists at Rutgers University, New Brunswick, have used this area as an out-of-door laboratory for years.

The tract contains white oaks that tower ninety feet or more — one with a circumference of 10 feet 11 inches, is said to be 300 years old. Other trees in abundance include black, red and pin oaks, red and shagbark hickories, white ashes and beeches estimated to be between 150 and 250 years old.

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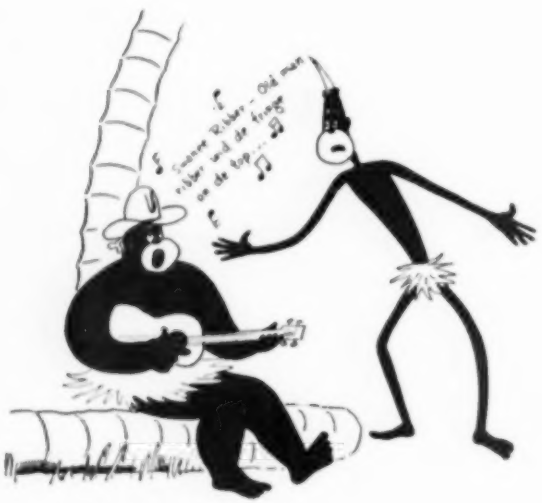

ADVERTISING which tries to take in too much territory is likely to be garbled, weak, ineffective. By contrast, advertising which concentrates its effort in specialized media can give deep market penetration, strong impact, — just like advertising to manufacturers, formulators, dealers and distributors of agricultural insecticides, fertilizers, fungicides, herbicides, etc., through the pages of

AGRICULTURAL CHEMICALS

175 FIFTH AVE. NEW YORK 10, N. Y.

Member Audit Bureau of Circulations

The National Safety Council, Chicago, Ill., has named its Public Interest Award winners for 1952 in a recent release. We are happy to report that AGRICULTURAL CHEMICALS was among the magazines cited for honor, in connection with publicity given to the safety movement in the fertilizer industry.

Ned H. Dearborn, NSC president comments that acceptance of the safety program by publications and other media "Is vital to the success of the accident prevention movement because public information media command the channels of mass communication which make it possible to reach and teach the public. This award program reveals a growing realization that by protecting the welfare of the individual, we also protect the welfare of the nation."

* * *

As a sequel to the Congressional Subcommittee's investigation of Russian potash being dumped on the U. S. market, Rep. Thomas G. Abernethy, Mississippi, reported to the U. S. Congress on May 5 that there is "good evidence that Russia's threatened dumping, insofar as potash is concerned, at least, already has begun." He referred to the testimony of fertilizer men as "startling" and observed that "if this dumping of Russian-controlled potash is allowed to continue, more and more American fertilizer manufacturers would be forced to buy it in order to stay in business and to compete pricewise with firms who were doing so. And the more of it that is bought, the less domestic production would be bought and consumed. Thus, we have the makings of a complete disruption of a great American industry with incalculable danger to American agriculture . . .

"American manufacturers requiring potash do not want to buy Communist material. By far the majority of them who appeared before our committee testified that they had refused to do so, even though the price was less than that at which American producers can afford to sell. I heartily commend their patriotism."

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Cotton fields like this are worth protecting. Low-cost toxaphene dusts or sprays, properly applied at the right times, will safeguard *yours* against all common insect pests.

THIS IS THE CRITICAL TIME TO CONTROL COTTON INSECTS

These tender young cotton leaves make good eating for such insect pests as thrips. Just one insect attack at this stage will seriously damage the plant. Cotton plants are protected economically and effectively through every stage of their growth with timely applications of low-cost toxaphene dusts or sprays.

Young cotton plants make a costly meal for insect pests. One heavy infestation at this stage can ruin a perfect stand. The most economical and effective way to protect your crop now and throughout the season is with toxaphene dusts or sprays.

Toxaphene kills all common cotton insects. It will see you safely through every attack. Toxaphene is available practically everywhere. Check its *actual cost per acre* with your local supplier and see for yourself that it is the greatest buy in cotton insecticides.

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